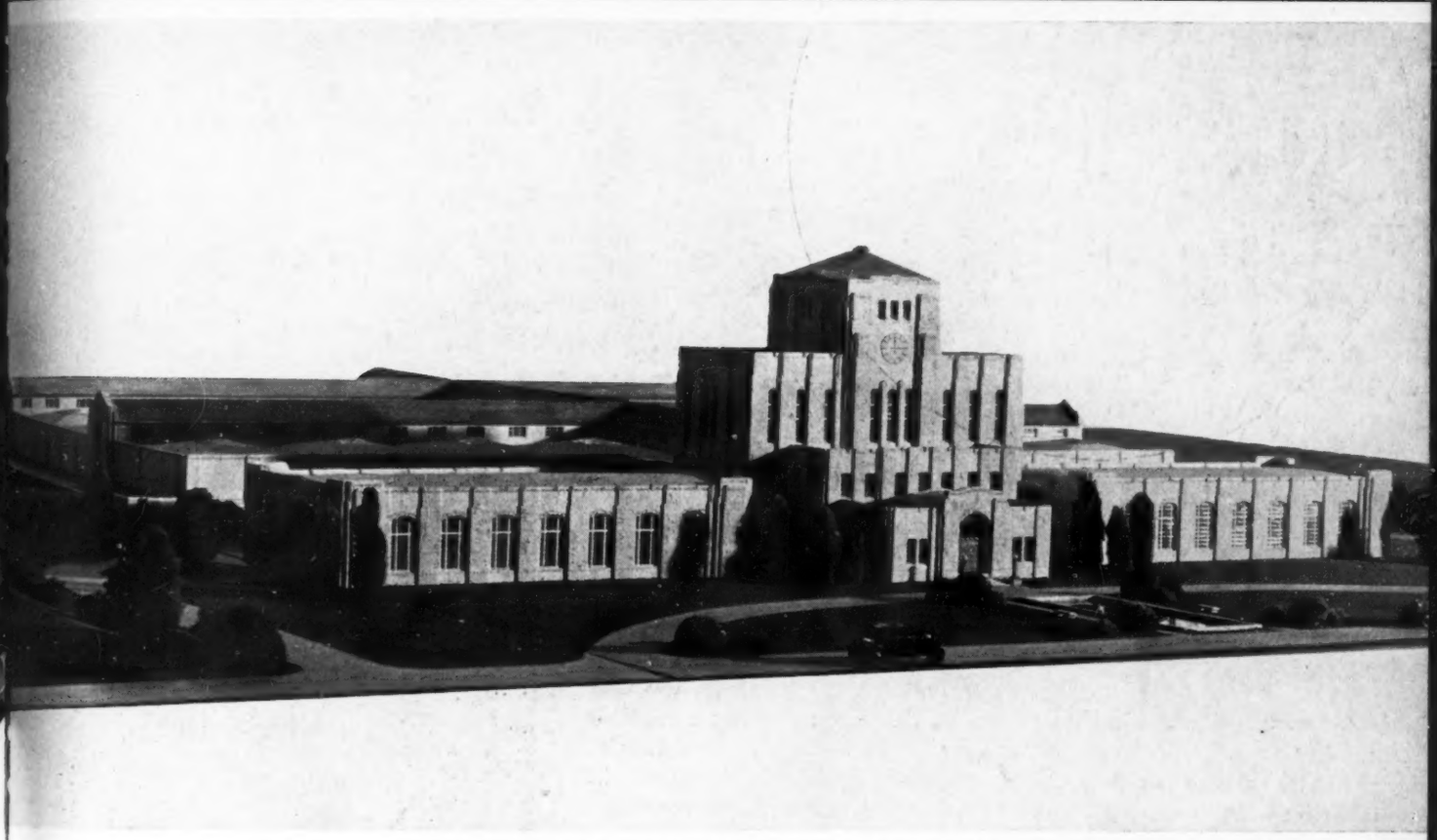
WATER WORKS AND SEWERAGE

December, 1935 — Editor — Vol. LXXXII. No. 12



Model of Milwaukee 200 M.G.D. Filtration Plant—Now Under Construction. [Alvord, Burdick & Howson, Engineers; Joseph P. Schwada, City Engineer]

IN THIS ISSUE

Milwaukee Water Purification Plant

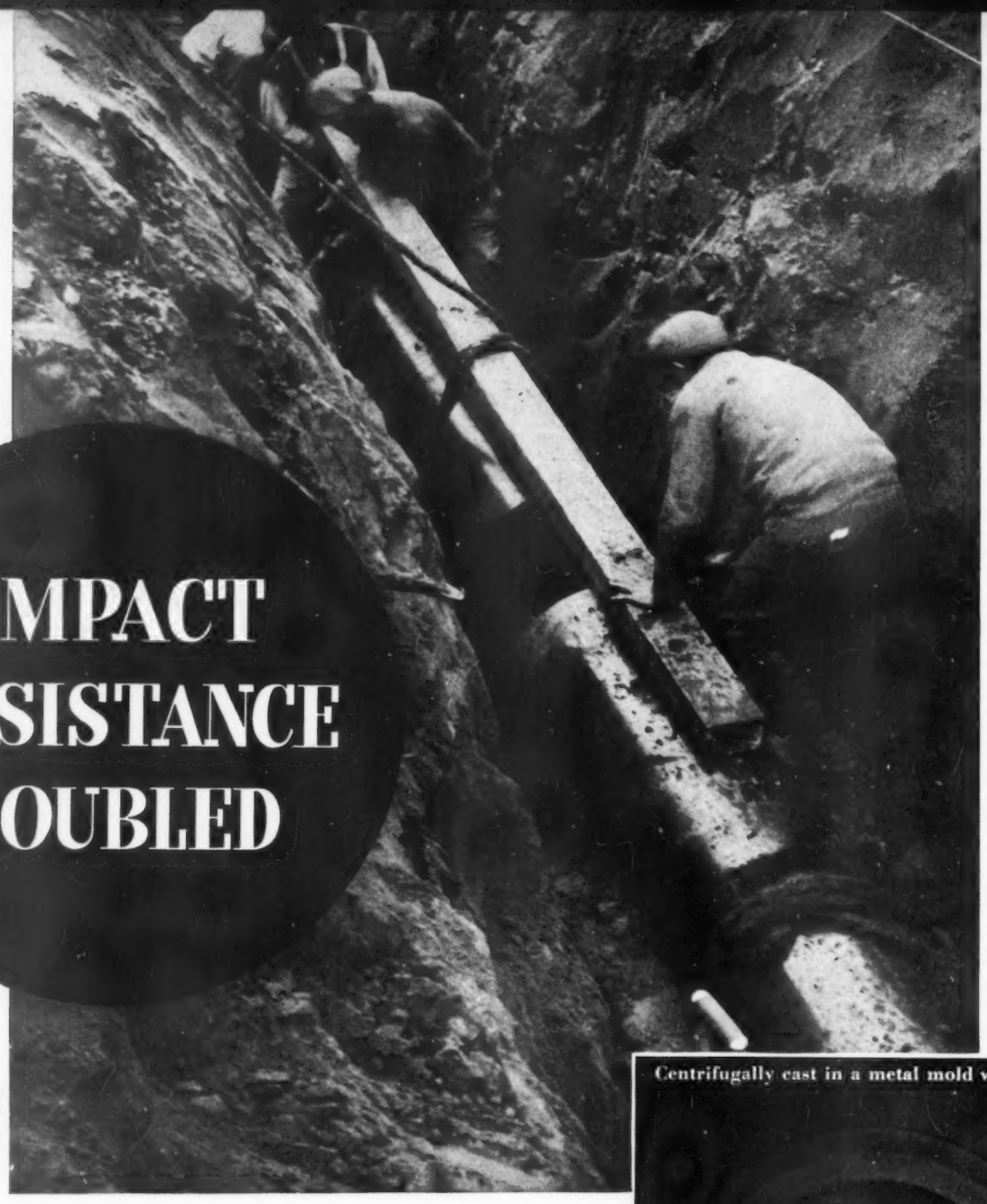
Report of Meeting of Virginia Section A.W.W.A.

The Menomonee Falls, Wis., Activated Sludge Plant

An Improved Method of Rating and Sampling Wells

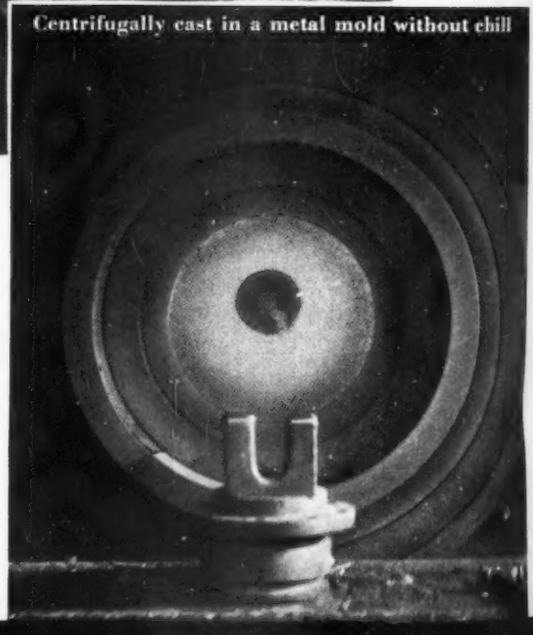
Joint Convention N. C. Section A.W.W.A. and N. C. Sewage Works Association

IMPACT RESISTANCE DOUBLED



Recent installation of Super-de Lavaud Pipe at Pensauken, New Jersey

Centrifugally cast in a metal mold without chill



A 270-year-old main in France still transports water—a 500-year-old temple roof in China still sheds rain — both are cast iron. The passing centuries which have proved cast iron's effective resistance to rust have also witnessed great advances in the manufacture of cast iron pipe. The Super-de Lavaud Process, developed and patented by this Company, is the first commercially practicable method of producing *unchilled* gray iron castings in a metal mold. Super-de Lavaud Pipe with doubled impact strength, *cast without chill in a metal mold*, was publicly announced in February 1934. In December 1935, with nearly 9 million feet installed, evidence is overwhelming to the effect that Super-de Lavaud is a stronger, tougher, more ductile pipe. Ask for descriptive literature.

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WATER WORKS & SEWERAGE

L. H. ENSLOW,
Editor

FUTURE ARTICLES
To Appear in the Next and Subsequent Issues

"Developments in Water Supply and Purification"—constitutes the annual review of developments during the past year in the water supply field. The reviewer is Professor Lewis V. Carpenter, until recently at the University of West Virginia and now Professor of Sanitary Engineering at New York University.

"Developments in Sewerage and Sewerage Treatment"—by Samuel A. Greeley, well known Consulting Engineer of Chicago, which will appear in February, constitutes a review of progress in sewerage and sewage treatment during the year 1935.

"Specifications for Filtering Materials"—will be discussed from the standpoint of basic requirements by John R. Baylis. He will present a set of suggested specifications which have been drawn from knowledge gained during several years of experimentation at the Chicago Experimental Filtration Plant, plus observations elsewhere.

"Practical Problems in Water Distribution"—by E. W. Breitkrentz of Los Angeles, constitutes a discussion of experiences in construction, repair and opperation problems in the Los Angeles Water Department.

"Some Practical Aspects of Chlorine Handling"—by Chris F. Bingham, Supt. of Filtration, Richmond, Va., sets forth many operating experiences and improvements of high practical value in chlorine handling and the maintenance, the operation of chlorinating equipment, and in chlorinating procedures.

"The Odeeometer—Its Place in Control of the Activated Sludge Process"—by Professor L. H. Kessler of the University of Wisconsin, will describe the basic principles of the interesting "Odeeometer" (Oxygen Demand Meter) and its applications in quickly revealing oxygen balance and facilitating economical control of the activated sludge process.

"Scale and Corrosion Control in Aqueous Systems"—is to be dealt with by D. W. Haering, Chemical Engineer of Chicago, Ill. The most effective modern water corrosion control practices and the application of corrosion inhibitors will be discussed.

"Methods of Treating Milk Wastes and Milk Products Wastes"—by L. F. Warrick, State Sanitary Engineer of Wisconsin, describes practical methods utilized in treating milk wastes in Wisconsin, the results secured and costs.

"Determining the Required pH in Corrosion Control"—by Philip L. McLaughlin, San. Engr.-Chemist, West Virginia Water Service Co., reveals a procedure effectively used to determine the proper and economical pH adjustment of waters of varying alkalinity in the control of corrosion.

"Garbage Disposal via Sewage Treatment"—is a subject of considerable current interest. Cecil K. Calvert, Engineer-Manager of Waste Disposal Plants, Indianapolis, Ind., will disclose the results of large scale experiments, wherein ground or shredded garbage has been put through the Indianapolis Activated Sludge plant in varying quantities. The disclosures from this pioneering test are both interesting and illuminating.

Vol. LXXXII, No. 12

CONTENTS for DECEMBER, 1935

Milwaukee's Water Purification Plant 403
By L. R. HOWSON
Of Alvord, Burdick & Hawson, Engineers, Chicago

Virginia Section A.W.W.A. Holds Outstanding Meeting 411

The Menomonee Falls, Wis., Activated Sludge Sewage Treatment Plant 418
By ROBERT CRAMER, JR.
Of Robert Cramer & Sons, Engineers, Milwaukee, Wis.

An Improved Method Rating and Sampling Wells 422
By PAUL F. HOWARD
Of Whitman and Howard, Engineers, Boston, Mass.

A Modern Turbidmeter 423
By GRANT LAUGHLIN
Filtration Equipment Corpn., New York, N. Y.

Short Schools and Licensing 424
By EDW. S. HOPKINS
Prin. Sanitary Chemist, Montebello Filters, Baltimore, Md.

The Patent Situation in Sewage Treatment 425
By PAUL HANSEN
Greeley and Hansen, Engineers, Chicago

Joint Convention N. C. Section A.W.W.A. and N. C. Sewage Works Association 427

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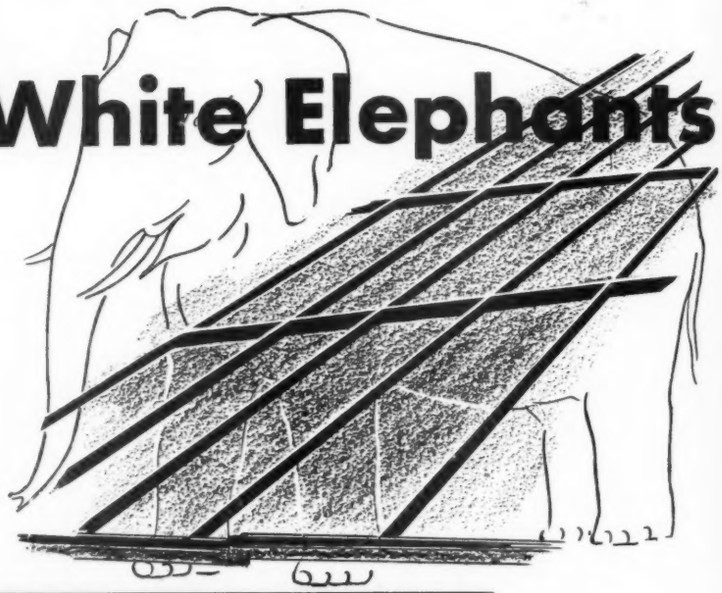
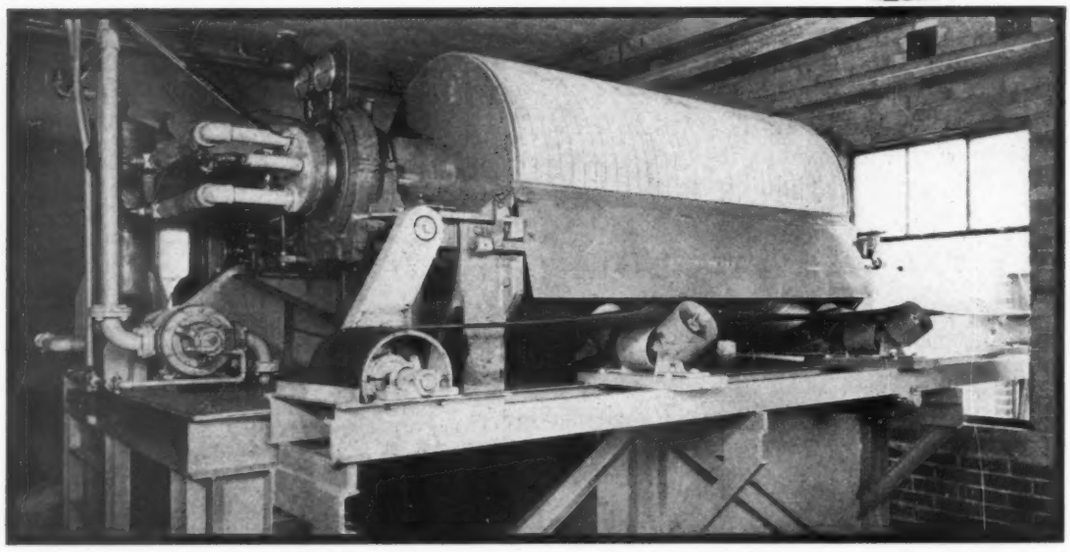
Taxpayers DON'T Like White Elephants

• • • and the method of handling sewage sludge that is obsolete soon after it is installed is sure one pale pachyderm.





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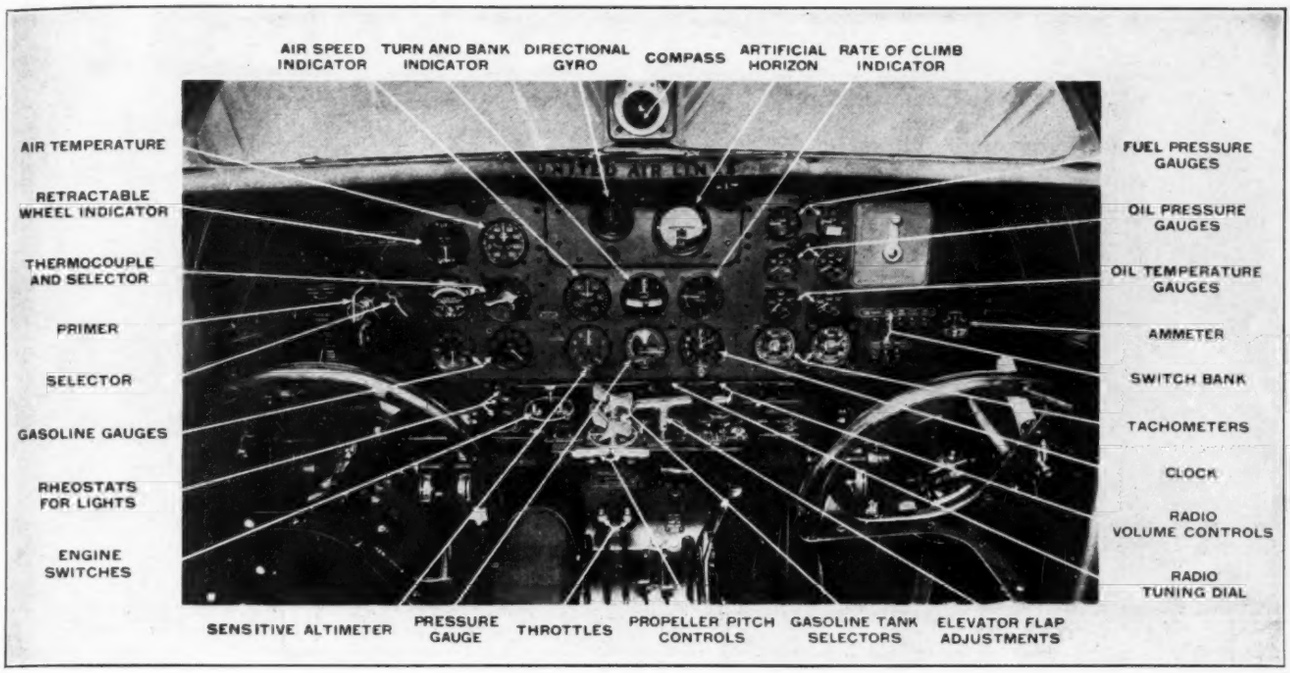

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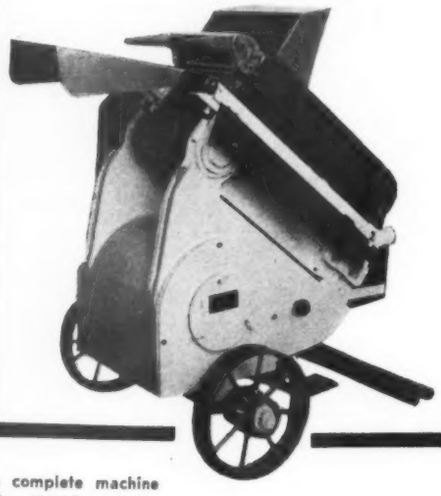

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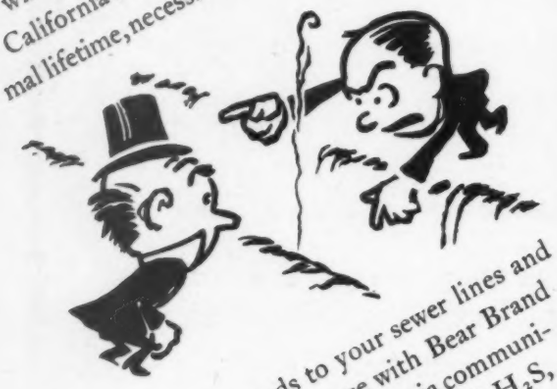

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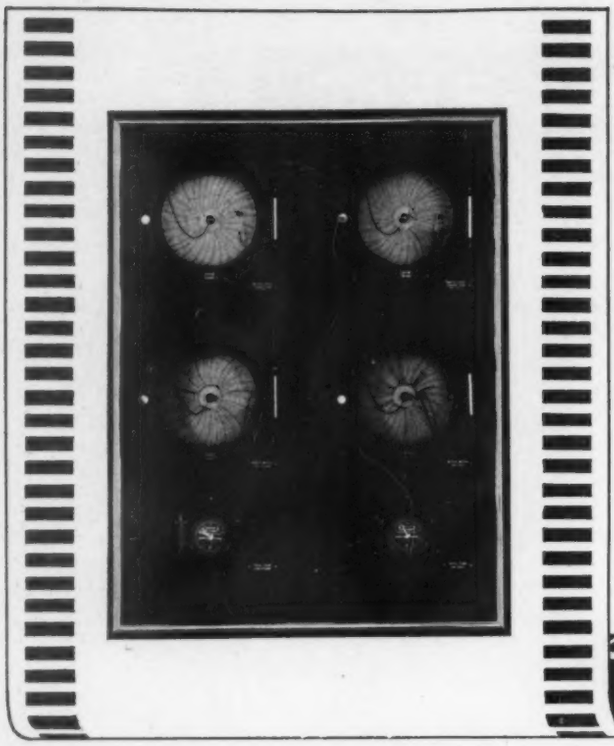

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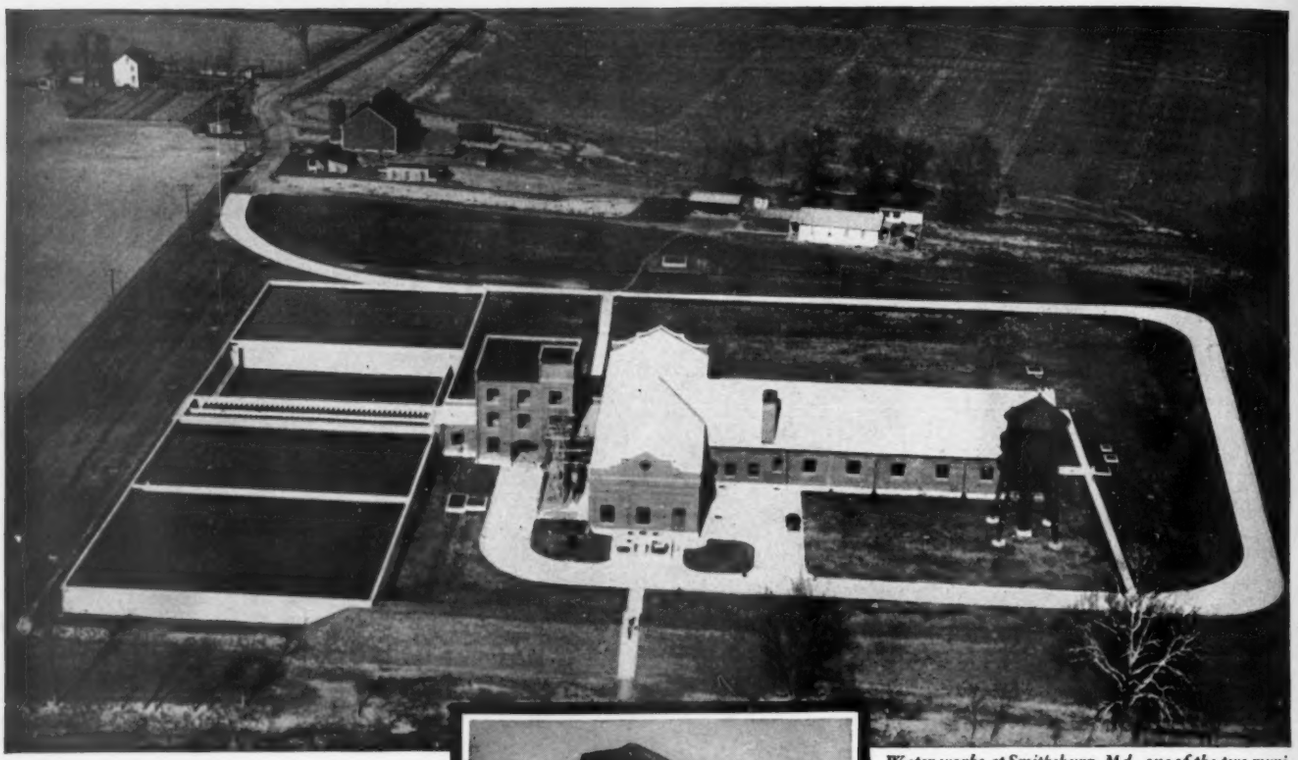

Water works at Smithsburg, Md., one of the two municipal water plants supplying the City of Hagerstown.

Hagerstown, Maryland, long a satisfied user of both Mathieson Chlorine and HTH

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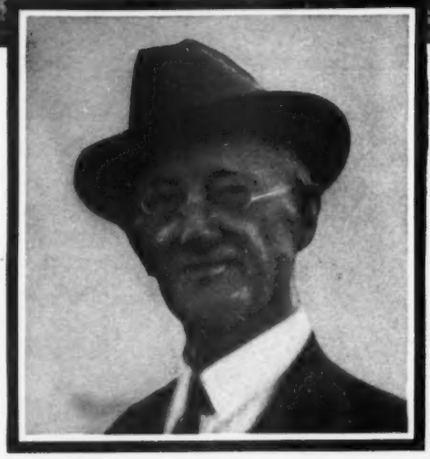

(Left) Albert Heard, Secretary of the Board of Water Commissioners, Hagerstown, Md.

In hundreds of communities throughout the country, HTH is working effectively, either alone or in conjunction with liquid chlorine, in a wide variety of sanitary jobs. These are described fully in a valuable 72-page book, "Hypo-Chlorination of Water," which is available free of charge to municipal officials. Send for your copy today.

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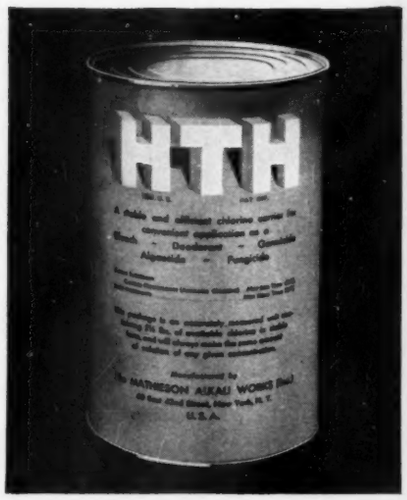

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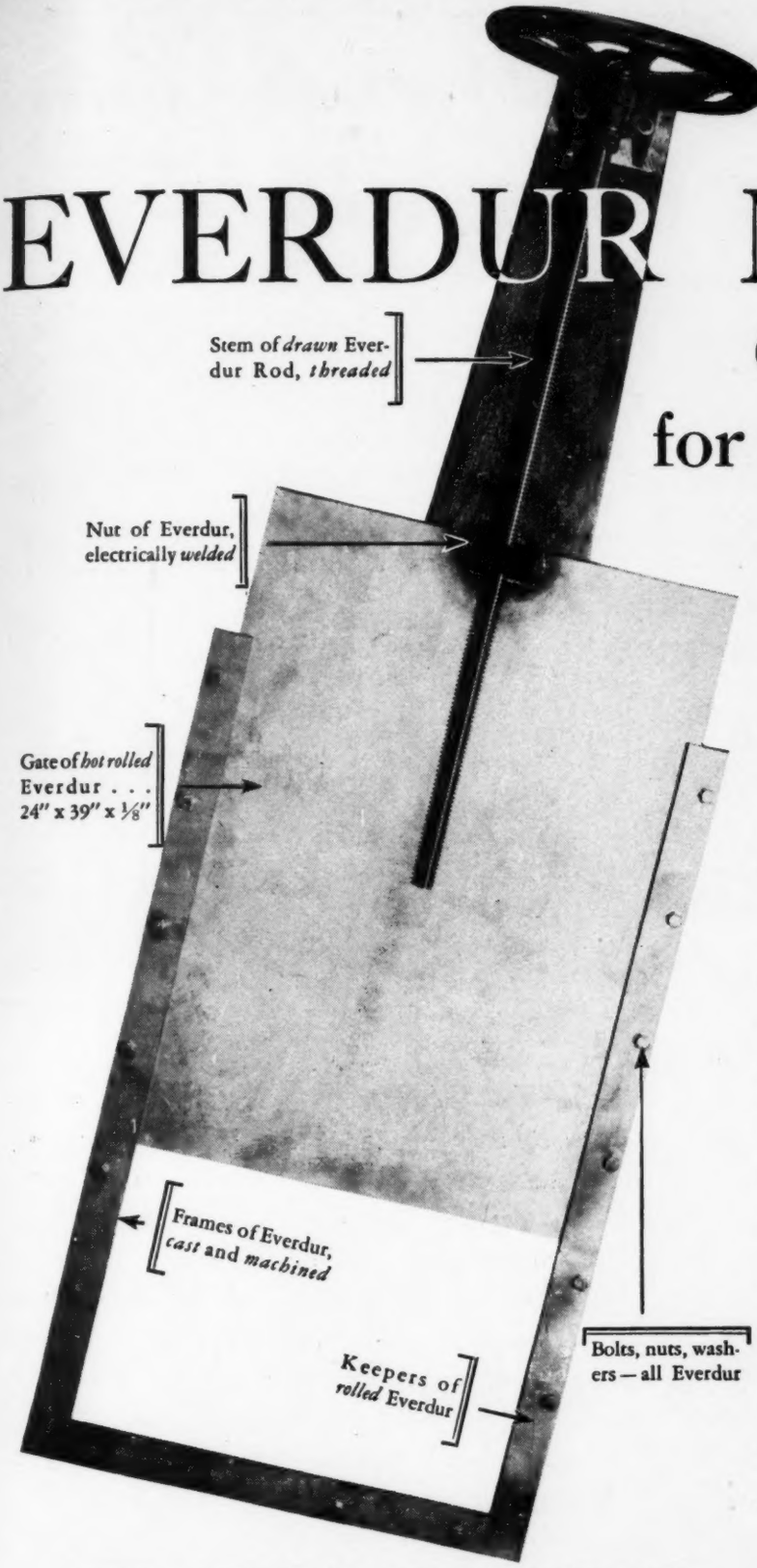
Stem of *drawn* Everdur Rod, *threaded*
Nut of Everdur, electrically *welded*
Gate of *hot rolled* Everdur . . . 24" x 39" x ⅛"
Frames of Everdur, *cast* and *machined*
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Everdur is being used for slide gates, weir plates, supporting bolts, baffle plates, screens and other metal parts exposed to sewage corrosion. The alloy is produced in all commercial forms and is easily fabricated by usual steel procedures.

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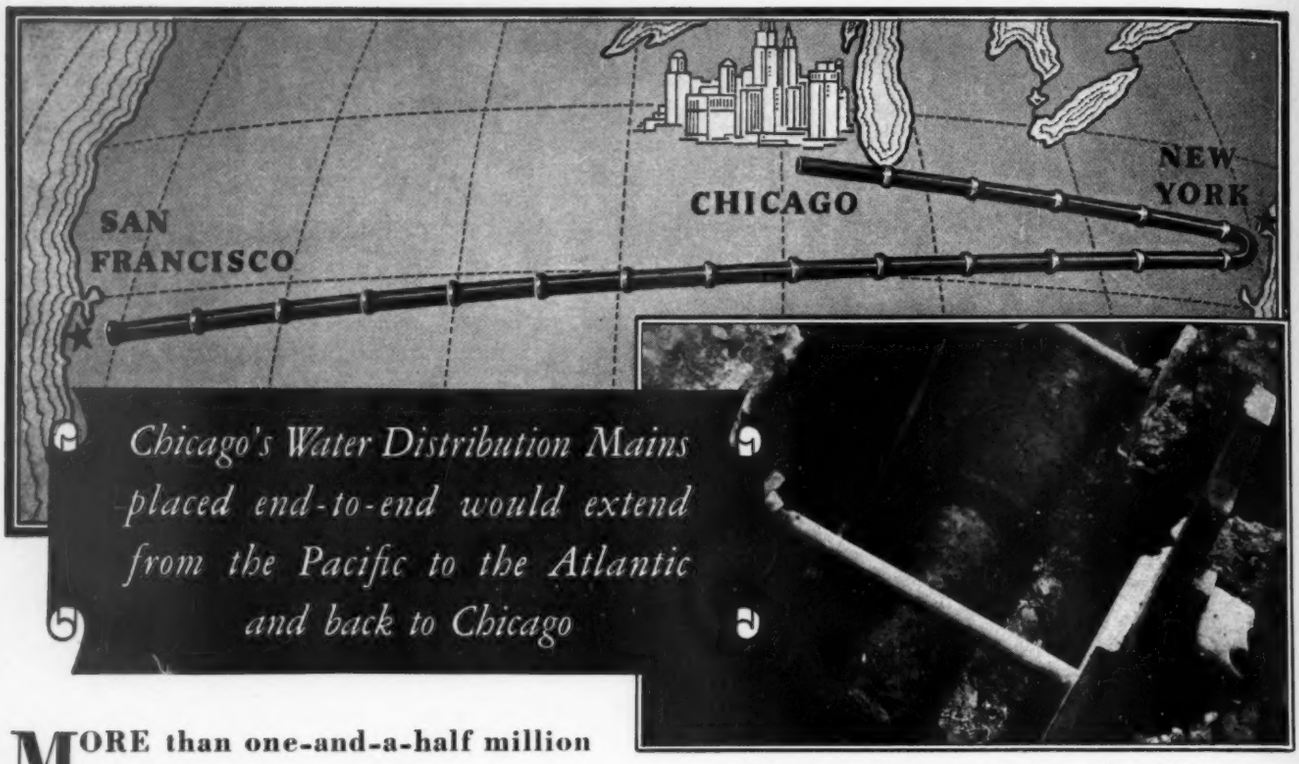
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Chicago's Water Distribution Mains placed end-to-end would extend from the Pacific to the Atlantic and back to Chicago

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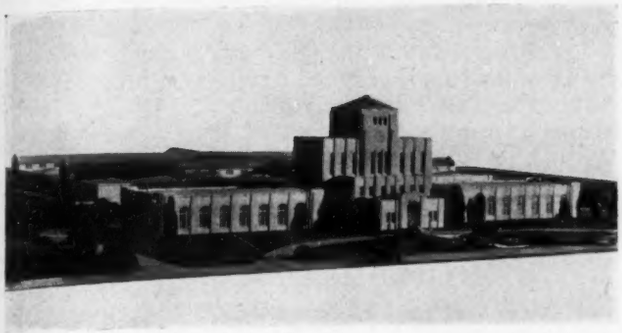
WATER WORKS AND SEWERAGE
A GILLETTE PUBLICATION
VOL. LXXXII DECEMBER, 1935 No. 12



Model of Milwaukee 200 M.G.D. Filtration Plant—Now Under Construction.

MILWAUKEE'S WATER PURIFICATION PLANT

By L. R. HOWSON, C.E.*
Chicago

THE City of Milwaukee has under construction a water filtration plant having a daily capacity of 200,000,000 gallons, standard rating. Its completion will climax many years of effort on the part of those entrusted with safeguarding the health of the people of Milwaukee to provide a more satisfactory water supply than has been possible with chlorination alone.

Milwaukee is so located that Lake Michigan, the source of its water supply, must also receive its sewage. Since approximately 60 per cent of the city's area is sewered on the "combined" system, overflows of sewage are frequent. Pollution of lake water resembles smoke in the air, in that its direction, intensity and velocity are continually shifting. Occasionally and without warning, the water supply has been subjected to objectionable tastes and odors, high bacterial counts and turbidity. The ability of chlorination alone to safeguard the quality of the supply has frequently been exceeded. In recent years Milwaukee has maintained a low typhoid death rate by using relatively heavy chlorination, but its deaths from gastroenteritis in children under two years have not been reduced as in other cities such as Cleveland, Detroit and Buffalo where filtration plants have been built.

Historical

In view of present day standards of sanitation and water supply engineering, it is interesting to note that the City of Milwaukee reached a population of 100,000 people before a public water supply was provided. The question of a public water supply had been agitated prior to the Civil War but the plans made at that time (1857) did not materialize. In 1868 the city employed E. S. Chesbrough, then City Engineer of Chicago, to prepare plans, specifications and estimates for the construction of a water works system. About three years later the Wisconsin legislature passed an act which adjusted the public debt and authorized the City of Milwaukee to construct and manage a water works through a Board of Water Commissioners. In 1873 the construction was undertaken.

The original plant drew water from an intake located approximately 2,100 ft. off shore in 18 ft. of water. The pumping equipment consisted of two pumps of 8 m.g.d. each which discharged into approximately 50 miles of distributing mains on which floated a 21,000,000 gallon reservoir. The total cost of the works was approximately $1,900,000.

The original 1,800 ft. intake which was located less than two miles north of the mouth of the Milwaukee River, into which most of the drainage of Milwaukee discharged, (Fig. 1) early became subject to contamination. Accordingly in 1890 it was decided that a new and longer intake terminating in deeper water, was necessary. The new intake was located on the line of North Avenue extended; the first 3,100 ft. from shore was 7½ ft. brick lined tunnel section which at the outer end divided into two lines of 5 ft. cast iron pipe, which extended 5,000 ft. further into the lake. This intake terminated in 60 ft. depth of water, approximately three miles from the river's mouth and 1½ miles from shore. The construction of this intake was attended with great difficulties and resulted in the loss of twenty lives. It required five years to complete it. Water from this intake was first used in September, 1895. The water from the new intake was much superior to that from the short intake but periodically and with increasing frequency, as time passed, Milwaukee suffered epidemics of waterborne diseases. This resulted in the employment of the

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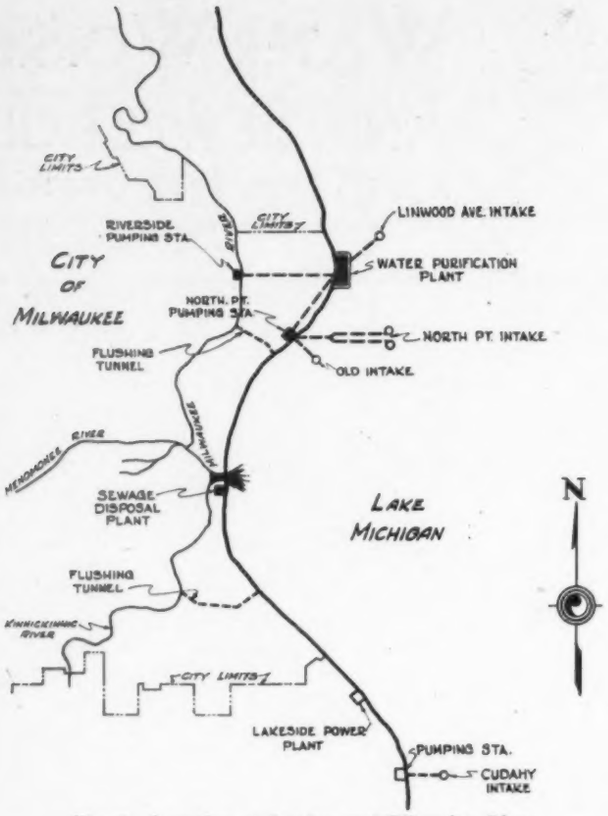


Fig. 1—Location of Intakes and Filtration Plant

special Milwaukee Sewerage Commission in 1911 composed of John W. Alvord, Harrison P. Eddy and the late George C. Whipple. The new Commission, although primarily charged with the study of Milwaukee's sewage treatment problem, recognized the close relationship between sewage treatment and the protection of the water supply. The Commission recommended, in addition to the installation of sewage treatment facilities, "that a filter plant be provided for the purification of the water supply, construction to be begun immediately." Nothing, however, transpired with respect to the water supply as a result of this report.

Peak water requirements having approached the capacity of the North Point intake, it was decided to build a new and larger intake at a point more remote from pollution and the Linwood Avenue tunnel (Fig. 1) was finished in 1918. This tunnel is 12 ft. in diameter, extends 6,565 ft. from shore and terminates in 67 ft. of water. The intake is approximately 4¼ miles distant from the mouth of the Milwaukee River. The tunnel is constructed from 80 to 150 ft. below the lake level. At the shore shaft it divides into two 9 ft. tunnels, one extending to the new Riverside pumping station built on the Milwaukee River, approximately 1¼ miles inland, and the other to the old North Point pumping station.

Since 1918, except for emergencies, all water has been drawn through the Linwood tunnel. The North Point intake tunnel is, however, maintained in operating condition and will be used for a short period during the construction of connections to the Linwood Avenue intake at the new filter plant.

In 1920 Joseph W. Ellms, of Cleveland, was employed by the city to operate an experimental water filtration plant and to advise the city relative to the necessity for and type of treatment best adapted to the local conditions. That report became a subject of local controversy and subsequent investigations were made by the U. S. Public Health Service, Mr. Harrison P. Eddy, and others.

Sewage Treatment Delayed Water Purification

A decision was made to proceed with the construction of a sewage treatment plant prior to undertaking water purification. The present Milwaukee Sewerage Commission was organized and under its direction an activated sludge plant was built and placed in operation in 1924. Subsequent events have demonstrated, that, contrary to predictions, the sewage treatment plant in itself did not adequately protect the water supply.

Beginning in 1926 the Milwaukee Engineering Department, under the personal direction of Mr. Joseph P. Schwada as City Engineer, undertook an extensive study of the source of the water supply, the factors contributing to its pollution, the analysis of the effect of this pollution upon the health of the community and other related factors. In 1933 Mr. Schwada prepared an exhaustive report on "Safeguarding and Improving Milwaukee's Water Supply with a Water Purification Plant." The comprehensive nature of his investigation and report and the tireless efforts of Mr. Schwada, in acquainting the people and the city officials with the situation, are directly responsible for the fact that Milwaukee is now rapidly nearing the realization of its long needed water purification facilities.

Early in 1933 consideration was given to securing Government aid toward financing construction of a purification plant and consulting engineers were employed to assist in the development of a plan, preparation of layouts and estimates. An application was subsequently made to the Federal Public Works Administration and an allotment secured, based upon a total estimated cost of $4,850,000.

The first contracts were let in the spring of 1934. At the present time (December 15) contracts have been let for more than half of the work and the plant is well under way—see Fig. 5.

The Plan

The filtration plant (Fig. 2), will have a rated capacity of 200 m.g.d. which will be adequate for the estimated maximum day's requirements of the year 1950. The location of the plant is along the lake shore where the Linwood Avenue tunnel intersects the shore line. The plant is being built on made land extending out into the lake approximately 1,000 ft. and along the lake shore approximately 1,400 ft., embracing an area of approximately 30 acres.

The raw water supply will be taken from the Linwood Avenue tunnel at the present shore shaft which will be

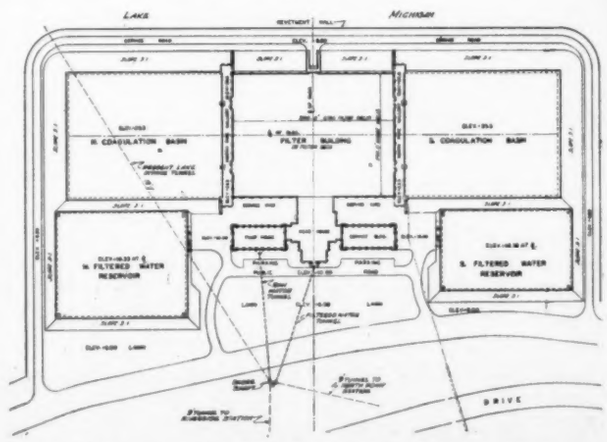


Fig. 2—Location Plan Milwaukee Filtration Plant

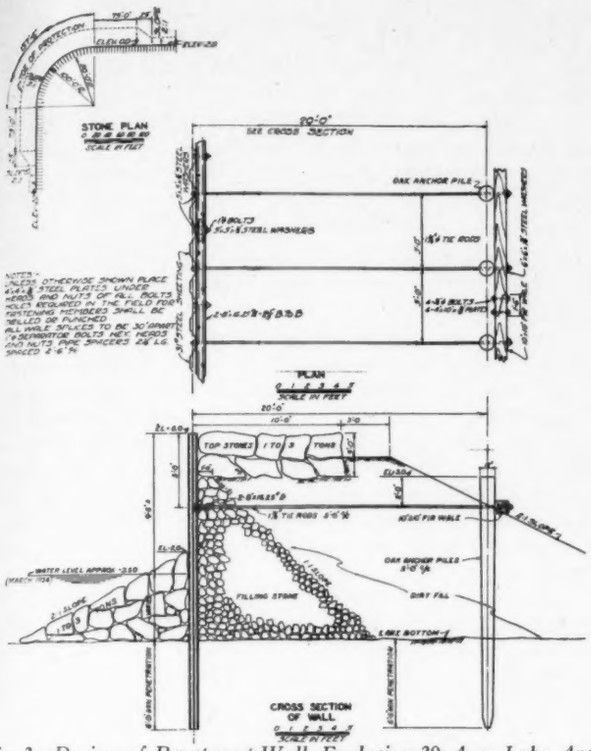


Fig. 3—Design of Revetment Wall, Enclosing 30-Acre Lake Area in Which Plant Is Being Built

disconnected from the 9 ft. tunnels to the Riverside and the North Point pumping stations. These two tunnels will serve as filtered water conduits.

The water will be lifted from the intake by five motor driven centrifugal pumps having a total capacity of 275 m.g.d. The pumps will discharge into a looped header and thence into the mixing, (flocculating) and coagulating basin structures.

The filter plant consists essentially of four 50 m.g.d. integrated units. There will be four flocculating and coagulating basins and four groups of filters.

The floc forming chambers will be of the mechanical-mix flocculator type, providing approximately 40 minutes detention at plant rating, followed by approximately four hours sedimentation and clarification in basins of the two-story type delivering to the 32 filters in batteries of eight units of 6¼ m.g.d. capacity each, at standard ratings of 2 gals/sq. ft./min.

A 12.65 million gallon clear-well is constructed under the filters and floats on the line with two isolated box type clear water reservoirs (Fig. 7) of 9.65 m.g. and 7.33 m.g. capacity. The total clear water storage is, therefore, 29,630,000 gallons.

A 750,000 gallon reinforced concrete wash water tank is built underground in the park immediately adjacent to the filtration plant site. It is placed at an elevation approximately 50 ft. above the filter plant and connected thereto by a 60 in. wash water main.

Revetment Wall

Since the entire plant was to be built upon made ground, extending from the shore outward into the lake, it was necessary to enclose and de-water the area prior to the beginning of construction. The construction of a revetment wall of impervious type was accordingly the first step in the program.

Hydrographic surveys, soundings and borings disclosed the fact that the bed of the lake at this location was made up of practically an unbroken matting of boulders, varying in size from a few inches to 8 ft. in diameter. It was difficult to secure information as to the depth to which the boulders might be found, and there was also considerable doubt as to the ability to drive steel sheeting or wood piling in the area. In view of the uncertainty and the very considerable amount of money involved in the construction of the revetment wall, it was deemed advisable, before designing this wall, to demonstrate through actual driving experience the practical difficulties that might be encountered. Specifications were prepared, using three types of steel sheet piling with wood anchor piles and an 85 ft. test section was so designed and located as to form a part of the ultimate breakwater construction.

It was found that piling of all types drove satisfactorily to depths of 4 or 5 ft. but that after 6 ft. penetration the driving of all types became difficult and slow. As a result of this practical demonstration, the revetment wall design specified a minimum of 6 ft. penetration for both steel and wood piling.

Early in 1934 plans and specifications were prepared for the revetment wall enclosure. The method of financing and available funds made it necessary to restrict the present construction to that required by the 200 m.g.d. plant instead of following contemplated plans looking to future plant extensions and a larger lake area enclosed. Restricted to shallow water area, land pile driving methods became practicable and the revetment wall section was then changed, for the entire distance, to a single line of "Deep Arch" type steel sheeting anchored to oak anchor piles, spaced at 5 ft. centers and located 20 ft. to the rear of the steel sheeting. The details of this section are shown on Fig. 3.

During the progress of construction, no unusual or unforeseen difficulties were encountered. The work was all done using land equipment operated on false work piling supports. The total thickness of the fill as measured from the face of the steel sheeting was approximately 75 ft. The revetment wall and the fill has proved so impervious that practically the only pumping necessary to keep the 30 acre site dry has been that occasioned by rainfall on the area itself.

Tunnel Connections

The location of the filtration plant is directly over Linwood Avenue tunnel which for many years has furnished practically the entire supply to the city. When the tunnel was constructed in 1918 a 15 ft. diameter shore shaft was constructed at the point where the tunnel intersected the shore line, where from the two 9 ft. tunnels diverage to the two pumping stations.

The plans for the filtration plant provide for taking the raw water from the Linwood Avenue tunnel, passing it through the various stages of the purification process and returning it from the clear wells to a new shaft connecting with the two 9 ft. tunnels.

It is of course necessary that the Linwood Avenue tunnel operations be interrupted as little as practicable. The design and the program of construction outlined therefore contemplates the following procedure: (See Fig. 4.)

1st. Build the 12 ft. raw water connection from the pumps (designated as 1 on Fig. 4) to within 40 ft. of the present shore shaft (designated as A on Fig. 4).

2nd. Close off the 9 ft. North Point tunnel connection with the Linwood tunnel (designated as 2) and supply the North Point station from the old intake. Build the 12 ft. connection from the clear water reservoirs (designated as 3) to the then unwatered North Point tunnel connection

including the 20 ft. diameter clear water shaft (designated as B). Connect the shaft to the present valved off cross connection to the 9 ft. Riverside station line (designated as 4).

3rd. Close the clear water gates in the 20 ft. shaft, open the sluice gates in the cross connection to Riverside station and supply both North Point and Riverside temporarily from the old North Point intake.

4th. Place a steel liner shell 12 ft. 6 in. in diameter inside the 15 ft. Linwood tunnel shore shaft extending from the top of the shaft to a point approximately 51½ ft. below lake level. The bottom of the annual space between this shell and the valve shaft walls will be calked and after that the 15 in. annular space will be filled to the top with concrete. A removable steel plate is left in the 12 ft. 6 in. cylinder opposite the eye of the raw water intake to the plant.

The remaining 40 ft. of raw water tunnel will then be constructed and the steel plate removed by a diver. Raw water may then pass from the Linwood Avenue tunnel (designated as 5) to the low lift pumps. Simultaneously the two other present connections from the 12 ft. Linwood Avenue tunnel to the present 9 ft. raw water tunnels to the respective stations will be blocked off. The water will then flow through the Linwood intake tunnel to the bottom of the present shore shaft approximately 80 ft. below lake surface, rise vertically in the shore shaft to the raw water conduit leading to the pumps with invert elevation approximately 40 ft. below lake level, thence be delivered by the low-lift pumps to the flocculating chambers and thence through the plant by gravity, returning to the clear water shaft in a 12 ft. conduit whose invert is 20 ft. below lake level. The clear water shaft connects with the two 9 ft. tunnels leading to the two pumping stations.

It is expected that the above outlined procedure will make it possible to make all connections with a minimum period of dependence upon the North Point intake.

Provisions for Surge

Up to the present time the Milwaukee Water Works has employed steam pumps. With the construction of the filtration plant, however, all low lift pumping from the tunnel will be done with motor driven centrifugal pumps which introduces the necessity of taking care of surge in the tunnel 12 ft. in diameter and approximately 6,500 ft. in length. Normally the pumps will be so operated that no important surge occurs. This will be accomplished through gradually closing the discharge valves on any pump, or pumps, so that the flow of water is gradually arrested. The necessity for special attention to surge relief arises through the possibility of an accidental interruption of power.

An extended study of several of the most practicable means of relieving the surge on the tunnel was made, including the following:

(a) Extension of all shafts up to elevation plus 40, the maximum elevation to which a surge would rise when water is being drawn through the tunnel at a 400 m.g.d. rate. In this plan the full surge pressure would be exerted on the entire tunnel including connections to the low lift pumps.

(b) Extension of the shore shaft and gate shaft to elevation plus 10 with provision for spilling on

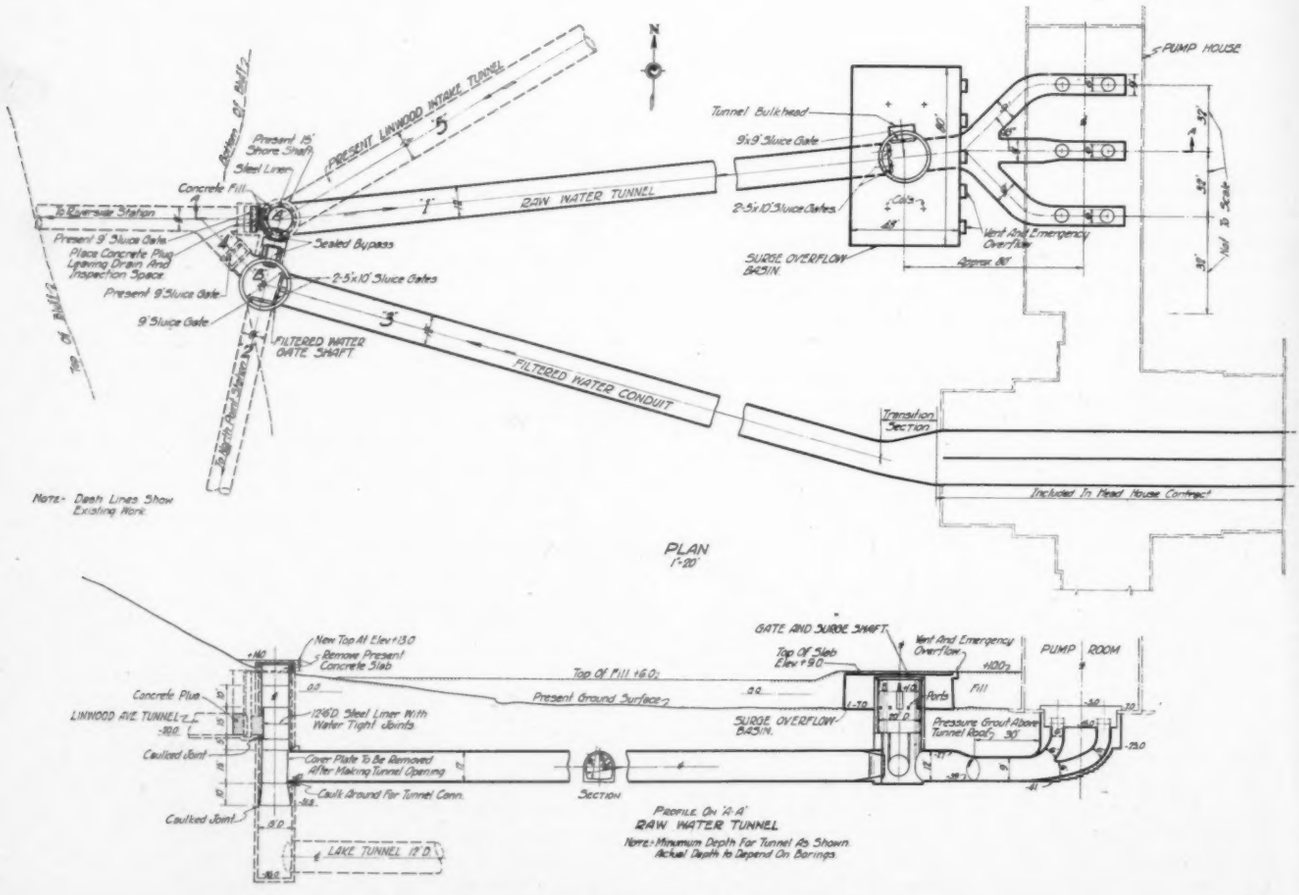


Fig. 4—Plan of Tunnel Connections and Surge Chamber

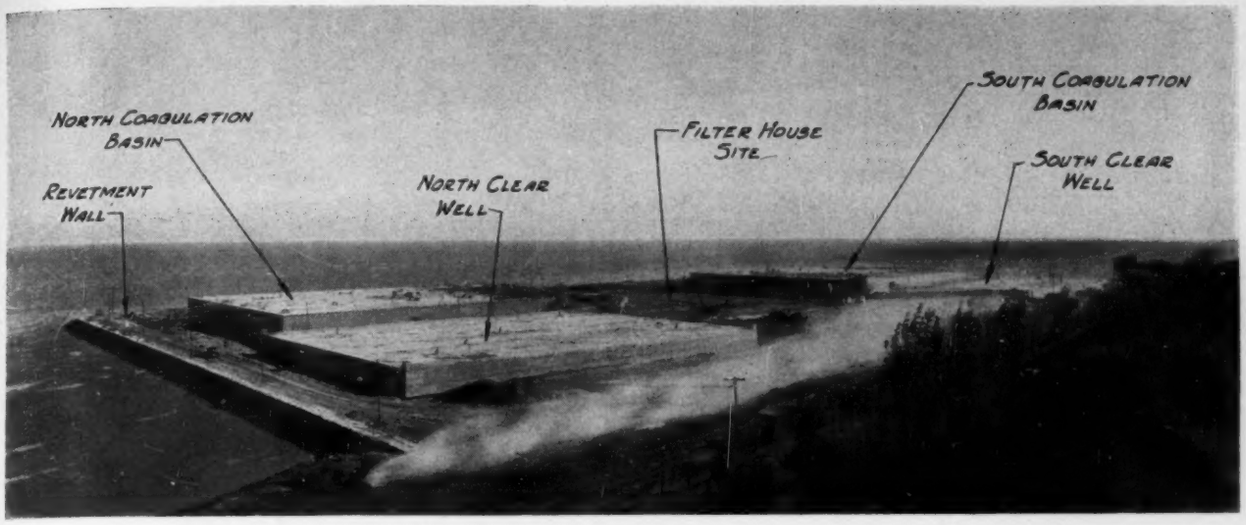


Fig. 5—The Milwaukee Filtration Plant as It Appeared November 1, 1935

the ground at that elevation, and with provision for conducting the overflow water to the lake. The maximum rate of spill at that elevation would be 595 c.f.s. with a maximum duration of slightly less than two minutes.

(c) Enlargement of the top of the shaft so as to provide underground storage adequate to accommodate the volume of the surge. (583,000 gallons above elevation 0.0 for 400 m.g.d. pumping rate.)

(d) A modification of plan "C" by which the size of the storage reservoir would be reduced through the carrying up of the shaft to elevation plus 10, with spilling to start at that elevation. (250,000 gallons for 400 m.g.d. pumping rate.)

(e) Two alternates by which the discharge of the surge flow is directly to the lake, the only difference being that a small amount of storage is provided in one case.

Plan (d) was that adopted for construction. The location of the surge tank and its dimensions are indicated on Fig. 4 and the cost of taking care of the surge by this method is estimated at but $8,000.

Settling Basins

The elevation of the lake bottom at the location of the mixing and settling basins was from minus 6 to minus 9. The water line in the basins, in order to provide for economic construction of clear water storage and filters, was set at elevation plus 22.5. The construction of basins having 30 ft. or more water depth was not thought desirable. The two alternatives therefore were:

(a) The placing of an hydraulically placed and confined sand fill under the basins and their support upon piling.

(b) The construction of two-story type settling basins into which the water enters at the bottom, flows across, then upward to return through the upper section.

A comparison of the relative costs of construction indicated that a saving of from $200,000 to $325,000 would be effected by the adoption of the two-story type of basin. Additional and relatively large savings result from the more compact layout of the two-story basins—see Fig. 6.

Observations of two-compartment, series settling basins on other Great Lake supplies have indicated that the heavy sludge would all be deposited in the lower story of a two-story settling basin and that only the light sediment, (mostly floc) would be deposited in the upper (return) story. This sediment is so light that it may be expected to largely run out as the water is withdrawn from the basin during cleaning.

Other advantages of the two-story settling basin as applied to Milwaukee conditions, are:

(a) Double the settling capacity can be provided on a given area. "Made" land behind revetment walls is costly.

(b) The deeper structures can be supported upon solid lake bottom instead of upon fill and piling.

(c) The water leaves the upper story of the settling basins at the same end at which it enters, thus requiring a minimum of large conduits.

(d) The two-story basin more effectively distributes the water over the cross section than is practicable in a deeper one-story basin of the same volume.

The two-story type of settling basin was accordingly adopted for Milwaukee. There are four such basins (297 ft. by 148 ft. each and 27½ ft. total water depth) with the two stories approximately equal in depth, i.e., slightly less than 14 ft. each—see Fig. 6.

Mixing and Flocculating Chambers

The water enters the mixing chamber through a rectangular conduit extending the entire width of the basin. In the top of this conduit is a 2 in. slot so directed as to deflect the flow against the front wall of the basin and in a direction opposite to the direction of flow through the basin. The first 76 ft. of each 372 ft. length of basin is utilized as a coagulating and floc preparation chamber in which are installed duplex flocculator units (14 ft. in diameter) operating on parallel shafts approximately 30 ft. on centers. A single motor drives each 148 ft. shaft separately. The flocculation chamber occupies the entire 27½ ft. of depth. The remaining 297 ft. of the basin length is of the two-story design, the lower floor substantially resting upon the lake bottom and the intermediate floor and the roof being supported upon reinforced concrete columns. Both intermediate floor and roof are of the flat slab type of construction. The intermediate floor is designed for a loading of 200 lbs. per square foot—and is sloped to drain toward 2 ft. by 2 ft. openings through it. These serve to equalize pressures when the basin is being emptied and provide openings

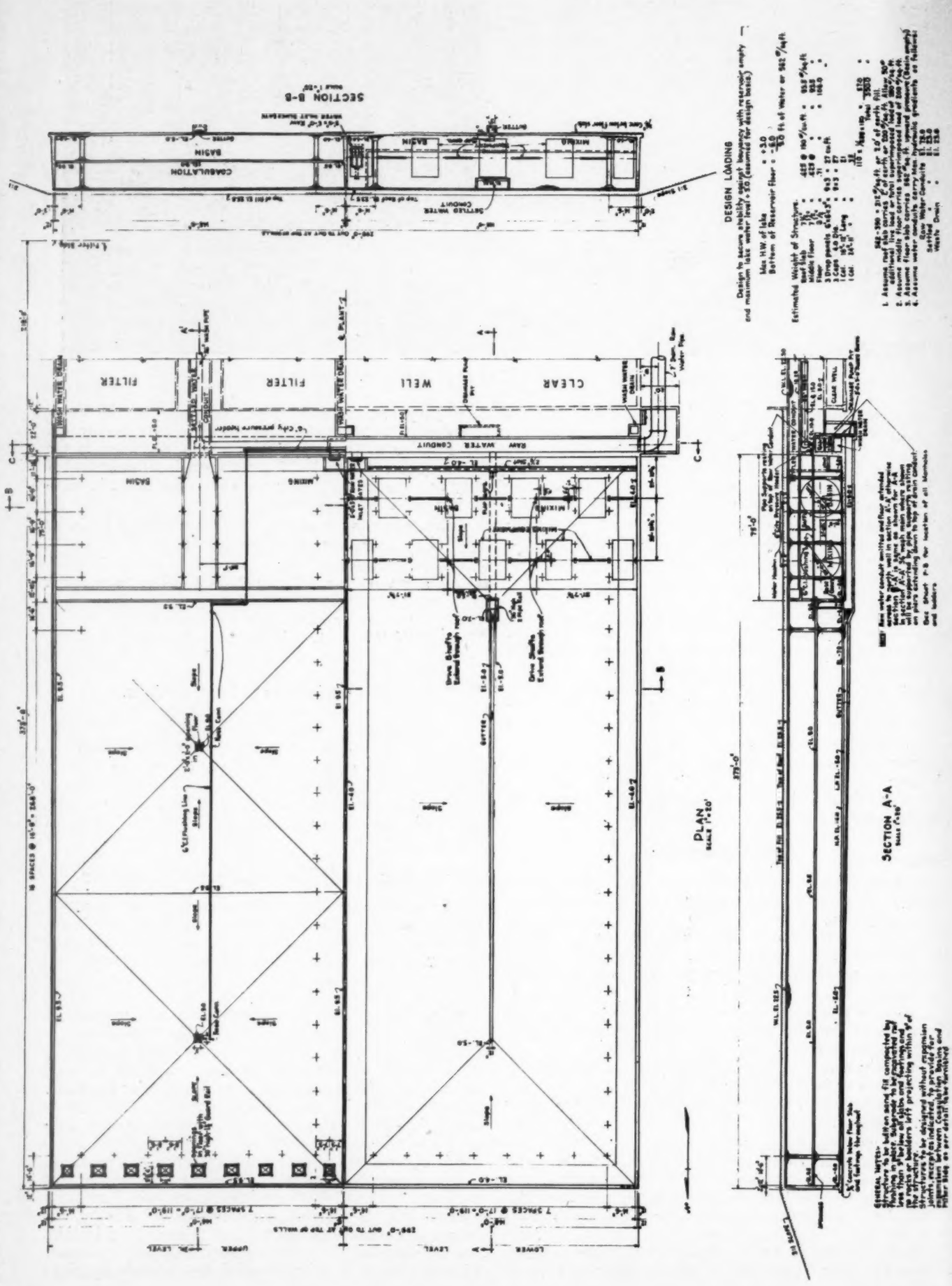


Fig. 6—The North Coagulation Basins and Flocculation Chambers

through which the light floc reaches the lower compartment for cleaning.

Since the floor of the coagulating and mixing basins are approximately 5 ft. below mean lake level, it was necessary to design against upward pressure. The floor is designed to withstand an upward pressure of 9 ft. of water or 562 lbs. per square foot.

The settled and clarified water is collected in cross-troughs extending entirely across the end of the upper compartments and thence is conducted in conduits across the top of the flocculating basins to the filter influent channels in the respective pipe galleries.

The lower compartment of the settling basin is designed so as to accommodate sludge removal equipment of the drag scraper type, believing that partial softening will be desired at some future date.

Filters

The filter plant itself consists essentially of four 50 m.g.d. plants each consisting of eight units rated at 6¼ m.g.d. at the standard filtration rating of 2 gallons per square foot per minute. The arrangement of the filters, connecting conduits, and influent channels is such that water from any of the four coagulating basins may be fed to any of the filter units. It is accordingly practicable to vary the mixing and settling periods within wide limits and remove entire units or batteries of units from service without interference with any of the rest of the operations.

The filter boxes are of the central gullet type with the wash water waste conduits located at the opposite end of the filter from the influent and wash water conduits. Facilities for washing at a 36 in. vertical rise, if necessary, are provided. Extensive consideration was given to the practicability of utilizing motor operation for the valves. It was found that the use of motor operated valves would increase the cost approximately $50,000 and this fact combined with the long demonstrated satisfactory operating record of hydraulic valves for this frequent use and hard service led to the adoption of hydraulic valves.

The underdrains are of the conventional cast iron construction. The specifications provide for pipe 4 in. in diameter spaced at 9 in. centers, with 7/16 in. perforations at 6 in. centers. A total of 51 inch depth of filtering material is provided. The freeboard from top of sand to lip of trough is 27 in.

Surface Wash Provided

Within recent months there has been a revival of attention given on the Lake Michigan plants to the efficiency of surface washing of filters. Mr. Baylis at the Chicago Experimental Plant has been studying various surface wash methods for some time. At Kenosha, Wisconsin, six of the fourteen filters have been equipped with surface wash for nearly two years, the remaining filters being equipped last year. The results upon the cleanness of the sand and the freedom from mud balls were clearly evident when approximately one-half of the filters were equipped with surface wash and the other half was not, all other conditions being the same.

The Milwaukee plans provide for the installation of surface wash of the pipe grid type similar to the Kenosha plan. Each filter will have a 16 in. connection with the main wash water pipe branching inside the filter into two 12 in. lines, one paralleling each exterior wall. The surface wash water is to be discharged through laterals from these 12 in. lines. The laterals will be of 2 in. pipe with bottoms located 2 in. above the normal sand level. On 8 in. centers ¼ in. perforations on the horizontal axis of the pipe are provided. The laterals will be spaced

Fig. 7—Clear Water Reservoir, Milwaukee Filtration Plant

3 ft. 6¾ in., center to center. When the sand is expanded during the washing operations, the surface wash pipes will be within the floating sand bed and the jets from the cross flow surface wash will provide the scrubbing action which has demonstrated its ability to prevent the formation of mud balls by Lake Michigan water.

Filter Beds

Particular attention has been given to the graduation of the gravel strata underlying the sand so as to maintain stratification without overturning of the gravel bed. which is so commonly experienced. The filter gravel is 24 in. in thickness. The bottom 5 in. ranges in size from 2½ to 1½ in.; the next 6 in. from 1½. to ¾ in.; the next 5 in. from ¾ in. to ½ in.; the next 4 in. from ½ in. to ¼ in. The maximum size in each layer is substantially the same as the smallest size in the layer next lower and the smallest stones in each layer are approximately half the diameter of the largest stones in the same layer. On top of the gravel is placed 5 in. of torpedo sand varying in size from ⅛ in. to that retained upon a No. 20 standard sieve.

The filter sand layer is 22 in. in thickness, having an effective size between .45 millimeter and .50 millimeter, and a uniformity coefficient (Hazen method) between 1.25 and 1.50. After installation of the sand and after backwashing at the standard rate, any sand passing a No. 42 standard sieve will be removed and replaced by sand as specified above.

Clear Water Storage

Clear water storage is provided in four basins. Two are located directly under the filters (one each side of the central effluent duct into which all filter effluent lines connect), and have a combined capacity of 12.65 million gallons. Two others, located in front of the plant have capacities respectively of 7.65 and 9.33 million gallons. —See Fig. 2 and 5. They are all of the standard box flat slab type construction.

Chemical Handling and Feeding

Facilities are provided for the feeding of alum, lime, ammonium sulphate, activated carbon, liquid chlorine and ammonia. All of these chemicals will not be fed continuously or at the same time. However, facilities are provided so that advantage may be taken of market conditions which may influence the purchase of chemicals from time to time.

The filtration plant is not located adjacent to a railroad. It will accordingly be necessary to truck all chemicals to the plant. The layout at the plant has been designed with the idea that deliveries will be made in special dump trucks of about ten tons capacity which, with the facilities provided, can be dumped into a bin in about one minute's time. During the process of dumping

dust will be sucked away by a motor driven fan delivering the dust laden air to an air filter.

After being discharged into the dump bin, located in the basement of the service building, the alum and lime will be elevated by a pneumatic conveyor system having a capacity of about 7½ tons per hour, to elevated storage bins having a capacity of approximately 70 tons each. From these bins delivery to the feeders will be by gravity through five-ton hoppers connected with automatic synchronous motor operated weighing beams which will measure the chemicals gravimetrically rather than by volume.

Provisions for bag storage of alum and lime are also available, utilizing an elevator rather than the pneumatic conveyor. Feeding equipment for lime and alum is interchangeable and is designed to deliver at any rate from 0 to 1100 lbs. per hour, the equivalent of about 2.4 grains per gallon at a pumpage rate of 100 m.g.d.

Activated carbon and ammonium sulphate have interchangeable storage bins, feed machines and bag storage. Each bin will hold approximately five tons of the light activated carbon or nineteen tons of ammonium sulphate.

Chlorination and Ammoniation

Two separate liquid chlorine rooms are provided, each to accommodate eight 1 ton containers. Four scales each carrying three containers, are provided. Six chlorine feed machines provide for pre-chlorination for each side of the plant, post chlorination and spare equipment. The chlorinators are specified to deliver up to 2.64 lbs. per million at 70 m.g.d. rates.

Ammonia will be fed as a gas through a machine comparable to the chlorine machine. Provision is made for storage of ninety 150 lb. cylinders and twenty-six additional cylinders are accommodated on the scales, a total of about two carloads.

Bag storage is provided on three floors of the head house. Floors are designed to carry 500 lbs. per square foot which will permit piling of activated carbon 10 ft. in height.

Troughs for alum and lime are of lead lined steel. The design is so made throughout as to have all chemical troughs readily accessible for cleaning.

The accompanying table reveals the provisions made for storage of chemicals at the plant.

Superstructure

The exterior of all structures is designed for the use of Lannon stone with cut stone trim. The layout is symmetrical about the center line of the head house which is flanked with the pump room and service building to the north and south respectively. —(See cover picture.) The filter house is also symmetrical with respect to the East and West center line of the head house. All structures are connected, the entire plant being under continuous roof.

The filter building being 297 ft. x 390 ft. in plan and with low head room requirements is given a "garden wall" type of exterior wall treatment. There are no windows, light being provided from large skylights, one above over each filter unit, and from windows in the upper walls of the operating galleries. All roofs are insulated with cork.

Building interiors in rooms open to the public are of terra cotta with floors of quarry tile.

Heating has been carefully designed with radiators so located as to provide comfortable temperatures in the head house, pump room, and filter operating galleries with a minimum of air circulation and heat loss over the large expanse of water in the filter house.

Personnel

The work is being done under the general direction of Mr. Joseph P. Schwada, City Engineer of Milwaukee, with Mr. H. H. Brown, Engineer in Charge, and Mr. Herbert C. Schmitt, Engineer of Construction. Alvord, Burdick & Howson are preparing the general and outline drawings and specifications and are consulting on all phases of the design construction and early operations of the plant.

▼

Hubert Smith Killed in Automobile Accident

Hubert B. Smith, popular Sales Manager of Simplex Valve and Meter Co., died on November 12th as the result of an automobile accident which occurred two days earlier while driving to his home in Ardmore, Pa.

Mr. Smith, after graduation in 1922 from Lehigh University, became associated with W. J. Ledoux, prominent Philadelphia engineer. He joined Simplex Valve and Meter Company in 1923 as Assistant Engineer and in 1925 transferred to the company's Sales Department where he made good, winning the promotion to Manager of Sales in 1929.

Mr. Smith was a member of Alpha Tau Omega, St. David's Golf Club, The American Water Works Association and other water and sewage associations. He is survived by his widow, a daughter, ten, and a son, six years old. Funeral services were held on November 15th in Philadelphia.

Hubert Smith was one of the youngest Sales Managers in the water works and sewerage equipment field. He was well liked by all who knew him, and met an untimely death at a period of the greatest fruition of his career.

TABLE SHOWING STORAGE OF CHEMICALS, MILWAUKEE FILTRATION PLANT, NOV. 11, 1935

	Alum	Lime	Amo. Sulphate	Act. Carbon	Liq. Chl.	Ammonia
Rate of use (average)	¾ gr. gal.	1 gr. gal.				
Lbs. per M. G.	107	143	8.4	20	8.4	2.8
Weight per c. f. lbs	50	50	60	8-25 av. 16		
Use per day, tons, average 80 m.g.d.	4.27	5.70	.34	80	.34	.11
Max. 143	7.65	10.20	.60	1.43	.60	.20
Dump bins, number	1	1	.			
Tons each (coned)	50	50				
Elevated bins, number	3	3	2	2		
Tons each	70	70	19	5		
Weigh hoppers	3	3				
Tons, each	5	5				
Bag storage rooms	1	1		1		
Tons (with aisles)	*120	*120		†95		
Total drums (storage and scales)					28	116
Drums, each, tons					1.0	.075
Total storage tons	395	395	38	105	28.0	8.70
Total storage days at average pumpage (1933)	92	69	111	131	82	79
Max.	52	38	64	73	47	42

*Piled 2 bags high on end.
†Piled to ceiling.

Carvin Cove Gap: Site of Roanoke Water Company's Dam-Site; Now Closed by a Concrete Dam Behind Which Is a 6.5 Billion Gal. Reservoir

VIRGINIA SECTION A. W. W. A. HOLDS OUTSTANDING MEETING

NEXT but one the youngest section in the American Water Works Association, the Virginia Section held what was in every sense an outstanding meeting in Roanoke, Va., on the 7th and 8th of November. Not alone in quality of program was a standard set, because the attendance exceeded 250 and the excellent exhibits of 39 manufacturers and firms gave to the meeting of the Virginia Section the setting and spirit of the "Little Convention" that it was.

The marked success of this, the second annual meeting of the Virginia Section, was due largely to the efforts of its Chairman—D. R. Taylor, Superintendent of the Roanoke Water Company—who was voted the high appreciation of the section in a special resolution drawn.

Meeting jointly with the Virginia Section was the Virginia Sewage Works Association.

Brilliant Dinner-Dance

At the close of the first day the Annual Dinner and Dance, with 335 attending, proved to be a brilliant affair and in many respects unusual. After brief addresses by Roanoke's Mayor, Sydney F. Small and Frank A. Barbour, President of A.W.W.A., followed by introductions of several other officers of the parent association in attendance, an exceptionally entertaining and humorous address was made by Dr. C. M. Newman, Head of the Department of English of the Virginia Polytechnic Institute, located some 30 miles west of Roanoke at Blacksburg, Va. Dr. Newman produced many sideaches with his now far famed address—"American Wit and Humor." This highly entertaining discourse, the excellency of the cuisine of the Hotel Roanoke, the flowers presented the ladies, the music of dance orchestra, and the bevy of "Virginia Beauties" in attendance, made for an exceptionally enjoyable evening.

During the dinner, the Nicholas Hill Cup, which is awarded that Section of A.W.W.A. showing the greatest per cent increase in membership during the year, was presented to the Virginia Section which, until the recent organization of the New Jersey Section, was the baby section of the association.

In the golf tournament, arranged the second day by C. E. Moore, Manager of the Roanoke Water Company,

Second Annual Joint Convention, Virginia Section of American Water Works Association and Virginia Sewage Works Association at Roanoke, Va. (A Portion of the 250 Attending.)

Stirling L. Williamson, Charlottesville, Va., President-Elect.

H. W. Snidow, Engineer, State Dept. Health, Secy. of the Assn.

the grand-prize was won by Eugene F. Dugger, General Manager, Newport News Water Works and Director of A.W.W.A. The prize was a silver cock-tail shaker donated by Belle Alkali Works. Other top prizes were won by: M. J. Seibert, Neptune Meter Co. (low gross); Gilbert Oakley, Roanoke Water Co.; R. B. White, Certainteed Products Co.; E. H. Herbert, Norfolk Water Dept.; Karl M. Mann, Waterworks Engineering; Vernon West, Roanoke Water Co.; W. B. Phillips, Standard Oil Co.

Inspection Trips

No scheduled inspection trips had been planned but many attending the meeting were shown over the properties of the Roanoke Water Company. Of considerable interest, was the new Carvin's Cove dam of the company, the dam site being about as remarkable a natural location for a dam as could be desired—see illustration.

Ample opportunities were made available by Chairman Taylor, during the meeting, for the inspection of the well arranged manufacturers' exhibits of equipment and materials which attracted an unusual degree of attention and interest. (In order to clarify an apparent misunderstanding in some quarters, it should be explained that those firms who are members of the Water Works Manufacturers' Association were invited to exhibit without charge, whereas non-member firms were required to pay for exhibit space.—Editor.)

New Officers

The following were elected officers for the ensuing year:

Chairman—Sterling L. Williamson, City Engr., Charlottesville, Va.

Vice Chairman—A. L. Meisel, Town Manager, Williamsburg, Va.

Secretary—H. W. Snidow, State Department Health, Richmond, Va.

Treasurer—Chris. F. Bingham, Supt. of Filtration, Richmond, Va.

Executive Committee—E. F. Dugger, Mgr., Water Works, Newport News, Va.; M. C. Smith, Engr of Water and Electricity, Richmond, Va.; H. B. Rice, Supt. of Public Works, Lexington, Va.

Technical Sessions

(Chairman D. R. Taylor, Presiding)

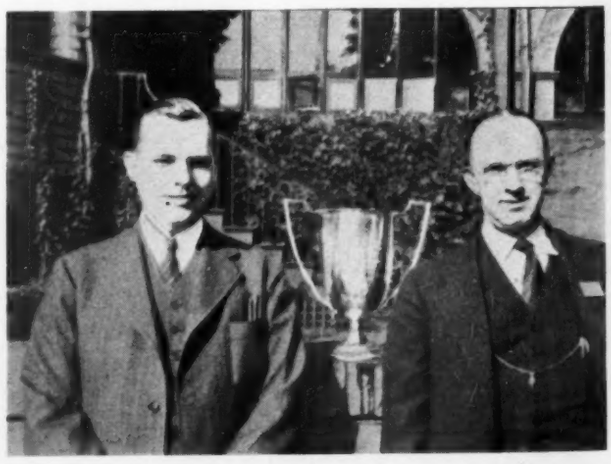
"Economies in the Selection and Operation of Electric Power for Pumping Equipment"—by D. P. MINICHAN, Engr., Appalachian Power Co., Roanoke, Va.

In his talk Mr. Minichan detailed the inherent advantages of motor driven pumping operations and stressed the cumulative economy which results from purchase of motor and pump efficiency (not capacity alone) even at a premium. He endorsed the practice of purchasing pumps with oversize casings, looking to a future day of needed increased capacity and the economy of changing impellers, rather than adding new units or being faced with complete replacement of existing units. Mr. Minichan said that synchronous motors should be accorded first consideration as the preferred prime mover for water pumps. Also, that modern automatic and remote control possessed distinctive advantages in raising the efficiencies and lowering the costs of pumping station operations and should therefore become more widely adopted.

E. F. DUGGER, General Manager, Water Works Commission, Newport News, Va., discussing the above paper, presented recent experiences before and since substituting electric driven centrifugal pumps in 1934 for the previously operated steam pumps at Newport News. Carefully repeated tests had indicated the two high duty (3,000 g.p.m.) units to produce overall efficiencies of 86 and 86.5 per cent as against the manufacturer's guarantee of 85.5 per cent. The low duty units produced efficiencies of 85.1 and 86.5 per cent against the guarantee of 85 per cent. The installation comprised two high duty Allis-Chalmers units (200 H.P. motors) to deliver 3,000 g.p.m. against 220 ft. operating head, and one 1,500 g.p.m. unit (100 H.P. motor) for the same head; two low duty Allis Chalmers units to deliver 3,000 g.p.m. against a 30 ft. operating head, and one 1,500 g.p.m. unit for the same head. Emergency equipment consisted of a Sterling-Viking engine with a 300 B.H.P. rating. Mr. Dugger reported that the investment of $60,000 in the new equipment had already shown itself thoroughly justified—the evidence being the reduction in pumping costs in the amount of $10,000 during the first 10 month period of service. In other ways, also, had the electric pumps out-performed the reciprocating units.

"The Diesel Engine for Water Works Duty"—by W. S. RUSSELL, Sales Engr., Bluefield Supply Company, Bluefield, W. Va.

Mr. Russell, formerly in charge of filtration and pumping at Salem, Va., presented an excellent evaluation of Diesel type engines as prime movers, in particular in water works operation. Improvements made in Diesel engines during very recent years had materially enhanced their value in respect to economy as well as dependability. The most important single factor was the low cost of fuel oil required and the high thermal Diesel efficiency, in which 35 per cent of the heat value of the oil was converted to energy as against 23 per cent



D. R. Taylor, Pres. (right) and Chris F. Bingham, Treas. Snapped with the Nickolas Hill Cup won by the Virginia Section.

Richard F. Wagner, Director of Utilities, Lynchburg, Va.

Frank A. Barbour, Boston, Mass., President, A.W.W.A.

conversion of fuel to power in the gasoline engine. In figuring costs for comparative evaluations, a depreciation of 8 per cent per year was fair for Diesels. With oil at 6 cents per gal. (delivered) and a consumption of 0.4 lbs. of oil per H.P. Hr., the cost of fuel could be taken as 0.35 cents per K.W.H. generated. To this, depreciation at 8 per cent per year would add from 0.1 to 2 cents per K.W.H. generated. A further addition of interest on invested capital would produce a total of between 0.5 cents and 3 cents per K.W.H. Taking such a variation into consideration, it was apparent that a careful analysis would be important in reaching a decision between power generation by Diesels as against other sources. The three important criteria to be considered were: load factor, fuel cost, interest rate on money. Sound, experienced engineering advice was, therefore, essential before arriving at decisions as to long term results in economy and dependability when considering available sources of power.

V. Von Gemmingen, Town Manager, Culpeper, Va., from the operator's viewpoint, named the distinctive practical advantages possessed by Diesel engines in the municipal field. The quick availability and dependability of modern Diesels had enhanced their value as standby units. He had found a figure of $1.00 per B.H.P. per year a fair one to use as depreciation. At Culpeper, the city owned power plant was being operated on Diesel engine power and electric current sold the Water Department at 3 cents per K.W.H. The first installation was a Fairbanks Morse Diesel (120 H.P.-2 cyl.) which had been driving a water pump by direct drive for several years. Carefully kept records had shown the cost of pumping had been only 6.3 mills per 1,000 gals. against an operating head of 400 ft.

"Lubrication of Water Works and Sewerage Equipment"—by W. B. Phillips, Engr., Standard Oil Company of N. J., Richmond, Va.

In a well prepared and excellently presented paper, Mr. Phillips discussed the fundamentals of effective and economical lubrication and lubricants for various types of water works and sewerage equipment. While justice can not be done the paper in this digest, some of the high lights will be presented. He stressed the easily appreciated fact that in purchasing so important materials as lubricants one could not afford to be penny-wise and pound foolish. In selecting bearing greases to be subjected to water contact, emulsification and waste of grease could be eliminated by specifying a lime-soap grease rather than the more soluble soda-soap grease more generally used in bearings. Concerning anti-friction bearings, over-lubrication was more important than under-lubrication. Too much grease, Mr. Phillips warned, would cause the balls to slide rather than roll and the slight flat spots thus created would lead to pronounced wear and real difficulties and expense in time. For lubricating steam lines, to engines, modern practice involved spraying the oil into the *center* of the line through quill-shaped inserts. In Diesel engine lubrication there was but one type of oil satisfactory for all points and that oil must be free of depositing carbon. To avoid seemingly inefficient lubrication, fuel oil used in Diesels must be of the right sort. For air-compressors, the manufacturers' recommendations as to lubrication should be followed, but ordinarily, 2 to 4 drops of oil per minute was good practice and sufficient. Mr. Phillips discussed many less easily reported phases of lubrication in his valuable paper.

E. H. Herbert, Chief Engr. of Pumping, Norfolk, Va., cited Norfolk experiences, in support of Mr. Phillips' statements and warnings. Old fashioned grease cups had been replaced some years ago by Alemite fittings and high pressure greasing. He had long ago found that lubrication economy resulted from purchasing only the best grades of oil, thereby reducing replacements materially at Norfolk.

"Painting Steel Tanks and Fire Hydrants"—by C. F. Harris, Division Manager, Detroit Graphite Company, Detroit, Mich.

Mr. Harris dealt with the primary essentials to be considered in painting or repainting metal surfaces. Efficient cleaning and application of spot-coat or priming-coat and avoiding doing the job in damp weather and at temperatures below 40 deg. F. were essential to success. The priming paint must have foundation qualities, including rust inhibiting properties. The intermediate (second) coat was to protect the less elastic priming material and prepare the way for the elastic finish coat. As a usual thing, he said, paints best for under-water surfaces are not as efficient against weather exposure. In painting fire hydrants *protection* was the least factor to consider, whereas permanence of lustre and color were the primary considerations. Regardless of how used, said Mr. Harris, the buyer of paint buys faith also. That meant that confidence in the manufacturer and his recommendations constituted an important factor in paint purchases.

J. L. Nairne, Certainteed Products Co., St. Louis, Mo., reported on the Ambridge, Penna., tests involving a large number of paints exposed to the severely corrosive Ambridge water during a period of 571 days, in which the Bakelite base paints had been given the maximum rating. The tests had been conducted jointly by the City of Ambridge and Pittsburgh-Des Moines Steel Company, with paint manufacturers cooperating. The results and evaluation of the various paints were available in a special technical bulletin (No. 3304) issued by Pittsburgh-Des Moines Steel and could be had for the asking.

C. D. Turner, District Manager, Wailes, Dove, Hermiston Corp., Philadelphia, Pa., presented additional

Marsden Smith, Engineer of Water, Richmond Va.; Beekman Little, Secy., A.W.W.A., New York City; Major Richard Messer, Chief Engr., Va. State Dept. of Health.

Snapped at Roanoke, Va.

From left: C. L. De Mott, Consulting Engr., Lynchburg, Va.; I. S. Vass, City Mgr., Waynesboro, Va.; Alan Wood, Builders Iron Foundry; R. V. Ford, Ford Meter Box Co.; M. C. Lofton, Columbian Iron Works; W. F. Cocke, City Manager, Monassas, Va.; F. C. Taylor, Pittsburgh Equitable Meter Co.

information on the Ambridge tests and said that although their Bitumastic Enamels had received a rating of 85 per cent, it was more important to consider actual service records of protective coatings. Bitumastic would stand on its record of 16 to 18 years of actual use on the interior of tanks, standpipes and pipe lines under a variety of conditions.

"The Railroad's Problem of Water Supply"—by E. P. TURNER, Prin. Ass't Engr., Norfolk & Western Railway, Roanoke, Va.

Mr. Turner, in a well prepared and rather lengthy paper, described the variety of water treatment facilities required in railroad operation. For treating waters with more than 5 gr. per gal. of incrustants lime-soda softening was the most favored and most economical process for reducing incrustants to between 1 and 1.5 gr. per gal. In recent years so-called wayside-treatment had come into use as a simple, effective and economical treatment. In this, sodium aluminate was automatically injected into the pump discharge line ahead of the wayside tanks. Rapid coagulation and precipitation, produced within the locomotive boilers, had eliminated incrustation and materially reduced foaming difficulties, the non-adhering sludge being expelled by blow-downs. This form of treatment had cost 2 to 3 cents per 1,000 gals. Lime-soda treatment had cost 4.5 to 5 cents per 1,000 gals., the average of incrustants removed being 1 lb. per 500 gals. treated. Quoting from a survey made by the A.R.E.A. to determine the effect of water treatment on railroads, Mr. Turner reported that 100 mile runs of locomotives between boiler washings had been increased to 400 miles. Boiler tube failures had been eliminated and maintenance reduced 50 per cent. In money, reduced boiler washing had saved $2,000 per month on the average, and for all roads reporting the total saved on maintenance had been $2,000,000 per year.

H. E. SILCOX, Ass't Engr. of Water Supply, C. & O. Railway, reported that the Chesapeake & Ohio system operated 72 plants—in which 84 per cent water used in steam production received treatment at a net yield of better than 80 per cent on the investment.

Water Works Practices and Fire Service

"Changes in Water Works Practices and their Influence on Fire Service"—by A. C. HUTSON, Ass't Chief Engr., National Board of Fire Underwriters, New York City.

Mr. Hutson reviewed the duties and the work of his organization in strengthening fire protection service of municipalities and water utilities, resulting in 10 underwriter classifications to cover the degree of fire service reliability. Naturally, he said, adequate and effective storage had been given major rank in ratings of water supply and referred to the value of a 1 M.G. elevated storage tank located in or near high value business districts of smal cities. This would in itself provide 3,000 g.p.m. fire flow for 5 hours. From storage it was considered bad practice to draw more than the upper 33 per cent for domestic use before insuring a refill, to maintain not less than 66 per cent for emergencies, including fire service. A possible shut-down of input to service storage for 5 days was considered a probability in arriving at storage requirements. Maximum fire service flows during 5 hours for small cities or 10 hours for larger cities was considered the minimum.

The chief weakness in water works facilities, said Mr. Hutson, was usually that of insufficient duplication of important equipment, especially was this a weakness at filtration plants. Dependence on by-passes around units in such plants, or the entire plant, was frowned upon by the National Board of Underwriters as an emergency measure. In lieu of minimum plant capacity more adequate storage of pure water was being demanded. In electrically operated pumping stations duplicate switch boards were highly desirable. As sources of standby power modern Diesel and gasoline engines were now considered dependable and adequate. One word of caution, in respect to these, was necessary viz.:—the needed provision of more than one fuel oil strainer ahead of the jet pumps to prevent failure due to clogging of a single strainer. In combined power and pumping stations the generator sets and pumps should be in separate rooms and motors should always be shielded from possible water damage.

Regarding pumps, the greatest weakness had been traced to failures in priming arrangements which should always be in duplicate. Lack of ample facilities for repairs and replacements of pumps and motors had been another weakness. Automatic operation of pump stations was questioned unless some manual attendance was also given in addition. Concerning pipe materials centrifugal C.I. pipes were now considered highly dependable and with the modern protective coatings of today steel pipe was also approved. On the newer asbestos-cement pipe, judgment had to be withheld until a greater service

A. C. Hutson, National Board of Fire Underwriters, New York City.

A. L. Meisel, City Manager, Williamsburg, Va.

Chas. A. Johnston, Supt., Water Works, Salem, Va.; J. P. Willikin, Chemist, Roanoke Water Co.; R. D. Wright, Engr., Water Dept., Lynchburg, Va.

period had elapsed. Too little attention had been given to maintaining pipe line capacities by the expedient of main cleanings. There was also need for increased replacements of obsolete fire hydrants with the newer improved types which were far more dependable. Sparcity of hydrants, necessitating long hose runs, remained too common a weakness of most systems.

The present interest in dual main systems was a justified one, said Mr. Hutson, and their adoption seemed to be a coming improvement. Designing such systems, to do all that was expected of them, was not, however, as simple as it might appear before going carefully into the matter. Such had been revealed through his studies of alternate arrangements and the effects procurable.

"Investigation of Water Supplies for the Shenandoah National Park Area"—by J. J. DIRZULAITIS, Chief Engineer, Water Resources Division, State Commission on Conservation and Development, Richmond, Va.

Mr. Dirzulaitis reviewed the studies made to determine the most satisfactory source of water supply for the mountainous Shenandoah National Park area. A decision had been reached to use under-ground flows from the talus formations on the lower slopes and in the valleys. Uniformity of flow in dry periods, plus coolness and softness, justified this development in preference to that of surface sources. The speaker described methods utilized in securing measurements of very small stream flows and exhibited a miniature velocity meter and special hook gages developed for exact measurements of such flows.

"Williamsburg's New Sewage Disposal Plant"—by A. L. MEISEL, Town Manager, Williamsburg, Va.

Mr. Meisel briefly described Williamsburg's new sewage treatment plant, which consists of Dorr clarifiers, separate digester, circular (rotary distributor) sprinkling filters 110 ft. in diameter and glass covered sludge beds. Operating results (presented) indicated a 90 per cent reduction in organic matter. Gas production of 0.6 cu. ft. per capita which had been utilized to heat buildings, maintain digester temperature at 80 deg. F. and supply hot water for garbage can washing at the adjoining municipal incinerator operator by the same crew as the sewage works.

The plants had been designed to harmonize with the early Virginia architecture of the buildings in Williamsburg, the restored Colonial Capital of Virginia. Odor control had been effectively secured by pre-chlorination and glass covered sludge beds; ponding and fly control by resting filters on successive days. Post chlorination was applied at the inlet end of the final clarifiers to maintain a residual of 0.05 to 0.1 at the effluent wier. In this effluent, gold-fish had been maintained as an attraction to the lay visitor and proof of the effectiveness of the treatment works.

STIRLING WILLIAMSON, City Engineer, Charlottesville, Va., in discussion, stated that chlorination at the two Imhoff tank plants at Charlottesville had been changed to a point ahead of the screen house to secure odor control in addition to disinfection and that sludge digestion had incidentally been improved thereby. During low night flows (weak sewage) there had been some corrosion in the screen house due to escaping chlorine. To subdue this, a thorough cleansing and application of "Simonize" automobile wax had been the most effective remedy tried. Sludge digestion had been satisfactory (without liming) at pH values of 6.8 to 6.9. A settling period of 2 hours had been as effective as that of 3 hours, producing a 90 per cent reduction in settleable solids.

Practical Chlorine Handling

"Some Practical Aspects of Chlorine Handling"—by CHRIS F. BINGHAM, Plant Manager, Filtration Division, Richmond, Va.

Mr. Bingham's paper constituted an outstanding contribution, in that it presented information of practical importance to designers and operators in the every-day operation of chlorination plants and chlorinating equipment. He referred to the recently published report by A.W.W.A.'s Committee on Chemical Hazards in Water Works Operation, which dealt with chlorine and its handling (see Jour. of A.W.W.A. for September, 1935) and explained that his paper would point out the application of some of the recommendations embodied in the report and results obtained. In short, it was an amplification of the report based on practical experience. Justice can not be done to Mr. Bingham's paper in the space available but the following are some of the more important disclosures.

For chlorine lines, the Chlorine Institute Standard Valve had proved the most reliable. In making up gas lines old litharge was to be avoided because it gradually lost its value as a cementing agent when mixed with glycerine. Copper tubing and "streamline" fittings had given satisfaction in running long gas lines. The use of silver-solder for such fittings had proved an essential, since ordinary solder had failed to resist the chlorine. For the purpose 25 cent pieces had been used for solder. Running gas lines on gradual grades, with drip-legs at low points, had prevented trouble from chlorine condensation therein and "spitting" of the chlorinator float valve. Such drip-legs should have 1.25 times the volume of the chlorine gas line and an electric bulb placed alongside or under these was recommended. Transite pipes had proved resistant to disintegration by chlorine water and a line of this material had been in continuous service at Richmond for 18 months. The initial attack had apparently been stopped by the protective asbestos fibers.

Fred E. Stuart, Industrial Chemical Sales Co., New York City.

W. B. Phillips, Standard Oil Co., Richmond, Va.

Prize Golfers

"Capt." Ned Herbert, Norfolk, Va. "Gene" Dugger, Newport News, Va. "Mike" Siebert, Richmond, Va.

Transite was brittle, however, and had to be adequately supported and protected.

An important and effective measure put to use at the Richmond plant consisted of transfer of ton containers of chlorine (in use) from the chlorinator room within the filter plant to a separate outside enclosure heated by thermostatically controlled air blowing. Just beyond the containers, between the manifolds and the long gas lines running 400 ft. (in duplicate) to the chlorinators, had been installed a pressure reducing valve on each. These valves had been supplied as special equipment by a chlorinator manufacturer and were set for operation to maintain not more than 35 lbs. but subject to change at will. A dependable and ample flow of chlorine to the machines was thereby assured, the hazard of high pressure on the lines and difficulties from re-liquefaction of gas at the chlorinators or along the line, was eliminated. The secret was that chlorine gas under normal container pressures was easily re-liquefied whereas under 35 lbs. pressure, only, no temperature drop outside of artificial refrigeration could create re-liquefaction. An added advantage was the reduced pressure on chlorinator shut-off valves on the line and the needle valves of the chlorinators.

Warning against the practice of refilling 150 lb. chlorine cylinders (by users) from one ton containers, Mr. Bingham said that an accidental overloading was a genuine hazard. He spoke from experience, when allowing 170 lbs. of liquid chlorine to run into a 150 lb. cylinder which produced a serious hydrostatic pressure almost to the point of rupture. Mr. Bingham also warned against over-boldness in handling chlorine leaks without aid of a gas-mask; and, that it was well to consider that a job requiring the mask should be handled as a two man job. Badly leaking containers should be submerged in the deepest available water as their safest disposition. Attempts to stop leaking chlorine by pouring on water and applying water spray had not been successful. To increase chlorine flow from a container by heat applications possessed a distinct hazard when recalling that the fusible metal of the safety plugs melts at 159 degrees Centigrade.

L. H. ENSLOW said that both Mr. Bingham and Marsden C. Smith were due a high compliment and appreciation of operating men and engineers, for their contributions with respect to chlorine handling. Many valuable thoughts and suggestions had come out of the practical developments and tests at the Richmond plant. Especially noteworthy was the adaptation of pressure reducing valves to maintain low pressures on the gas lines, the removal of ton containers from the building to an outside gassing chamber, and the outside (protected) container storage for maximum safety. In handling leaking containers it might be necessary at some time to waste the chlorine to a sanitary sewer if one was available. Chlorine, being heavy, would lay in the barrel of the sewer above the flow line, if not too rapidly discharged, and would travel through and be gradually absorbed by the sewage. In one instance he had known of a vault to be built to withstand pressure and into which a leaking ton container could be lowered and lid with gasket bolted down. An outlet therefrom connected to one of the chlorinator manifolds, thus allowing the leaking chlorine to be utilized instead of being wasted. Mr. Enslow said that he was glad that Mr. Bingham stressed the hazard of, and great care necessary in refilling chlorine cylinders by those who might not appreciate the danger involved, or the need of systematic valve inspection and overhauling.

"Lynchburg's New Supply Main" — RICHARD F. WAGNER, Director of Public Safety and Water, Lynchburg, Va.

Mr. Wagner presented a digest of the interesting history of Lynchburg's Water Works, the latest project being that of the Pedlar River development which originally made use of wood-stave pipe. A section of this line leaking badly had recently been replaced with 48,000 feet of 36 in. Class A and Class B (High-Tensile) C.I. pipe jointed with Leadite. This latest project had been financed in 1933 by P.W.A., in which crews of 200 men taken from relief rolls (after physical examination) were used. The hand trenching and filling required 2.78 man hours per yard of earth moved. The line was installed at a total cost of $11.57 per foot of pipe, the city's part being $8.27 per foot. The 4,000 tons of pipe and the fittings were produced by the Lynchburg Foundry and the project was completed within the 12 months estimated at a cost of $556,000, including the grant of $159,000.

"Water Works and Sewerage Improvements Under P.W.A." was reviewed by Col. James A. Anderson, P.W.A. Administrator, Richmond, Va., in which he said that 58 water and sewage projects in Virginia had been approved as P.W.A. projects; that 70 per cent of the applicants had been financially able and requested only the 45 per cent grant.

Trends in Treatment and Operating Kinks

"Operating Kinks for Filter Plants" — by F. E. STUART, Engr., Industrial Chemical Sales Company, New York City.

Mr. Stuart's paper constituted a helpful compilation of operating "kinks" employed at various water treatment plants scattered throughout the country. A few of these follow: Colored pins and a city map give an accurate picture of complaints registered, their nature and extent and have served at Richmond to indicate the result of improvements in water treatment. A dry-feed machine mounted on wheels had been used to advantage at the Indianapolis Filter Plant. Open troughs for conveying lime emulsion have advantages in maintenance over pipe or hose lines.

To observe the effect of varying pH values on corrosion, the treated water may be continuously seen through rusty nails. A layer of anthracite coal (Anthrafilt) replacing the upper portion of sand beds has been effective in increasing length of filter runs and lowering wash water required at Easton, Pa. For recarbonating softened water at Greenville, Tenn., dry ice is employed. Chromium plating can be efficiently cleaned with a mixture of flour and kerosene oil. Transite pipe, properly supported, has proved highly satisfactory for transporting chlorine water and chlorinated copperas at Richmond, Va., and Dallas, Tex. Effective coagulation removes copper sulphate added to raw waters. For pressure filters "Black-Alum," which contains carbon, has been found quicker acting and more efficient than ordinary alum. The leading operators are adopting pounds per million

gals. (P.M.G.) as the universal expression of chemical dosages, replacing grs. per gal. and part per million. From lime sacks, etc., the weight marks are torn off and composited as a record of the pounds used during each 24 hour period at Norfolk, Va. The sand of the Atlanta filters is kept clean by systematic application of chlorine water and soaking over night, therein, at intervals. At Nyack, N. Y., an over-night soak in 2 per cent caustic soda is followed by agitation of the top sand and with a portable high speed mixer consisting of motor, shaft and impeller which creates the scour. At Durham, N. C., 6 to 10 per cent of the mixing chamber discharge is pumped back to the inlet end to improve floc formation and save coagulant.

"Developments and Trends in Water Treatment Practices"—by L. H. ENSLOW, Editor, WATER WORKS AND SEWERAGE and Engineer, The Chlorine Institute, New York City.

Presenting a digest of some of the more important developments and trends in water treatment practice, Mr. Enslow touched on the improvements in, and the related growth of water softening, with especial reference to the Zeolite method in which improved Zeolites and enhanced salt economy had given impetus to this method either alone or in combination with lime-soda softening. In coagulation practice the growing use of iron salts was of interest. Richmond, Va., had adopted "chlorinated-copperas" within the year, with a resultant improved filtered water and a saving of $10,000 per year. The larger American plants were now being equipped to handle and store loose chemicals purchased in bulk at a material saving, the chemicals being unloaded and handled through vacuum lines without dust nuisance. Another improved coagulant meeting with favor was filter alum fortified with activated carbon known as "Black Alum." Especially interesting had it been in producing more effective and speedier coagulation and sludge stabilization. Mechanical flocculators had proven their worth and were being increasingly used.

In algae control an improved and more economical method of coppering reservoirs, (developed at Los Angeles) involved broadcasting of pulverized copper sulphate over the reservoir surface. Iron and manganese removal through Zeolite units had been on the increase as had automatic Zeolite plant operation. Two new chemical feeders had appeared on the market, one feeding by weight rather than volume and the other having no moving parts and feeding by varying the intensity of vibrations of the feed spout.

In filtration the trend was toward the use of coarser filter sands and anthracite coal, alone or in combination with sand. The new porous plate filter bottom which allows elimination of the gravel bed represented another promising development.

Mr. Enslow pointed out that corrosion control through pH adjustment of the finished water was becoming a universal practice but that the control was not as well understood as it might be. No rule as to the pH value required could be laid down because the bicarbonate hardness of the water was the controlling factor. Therefore, in the very soft waters pH values as high as 9.5 to 10 had been found requisite whereas for waters with 60 or more bicarbonate hardness the required pH value might be as low as 7.5 to 8.0. As the carbonate hardness increased the pH value needed became less. It would therefore be necessary in each case to determine the required pH value. The use of caustic-soda (at present prices), rather than hardness producing lime, deserved attention and was already being used to an increasing extent.

For taste control nothing had been found superior to the use of activated carbon and the ammonia-chlorine treatment. A combination of heavy pre-chlorination with carbon had been effective in severe cases, with ammonia added to the filtered water in post-chlorination. The value of ammonia-chlorine treatment to prevent after tastes in dead ends and control putrefaction and corrosion, by checking biological action in the mains, seemed to be proven in several instances—especial mention being made of Richmond, where the effect was first demonstrated. At Utica, N. Y., tuberculation of the long supply mains continued to be held in check by use of the ammonia-chlorine treatment at the reservoir.

The meeting closed with a brief Round Table Session devoted to answering questions deposited in the Question Box.

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Bunker Associated with Fuller & Everett on Bogota Project

(A Correction)

We have had called to our attention an error which appeared in the report covering the Proceedings of the New England Water Works Association. In the digest of a paper by Mr. George C. Bunker, Consulting Engineer of Panama (read in his absence), it was reported, on page 379 of our November issue, that the author had returned to South America "to supervise construction of the new reservoir, pipe line and filtration plant" at Bogota, Columbia. We are informed that this was erroneous; that, Mr. Bunker was retained only on the design of the purification works; whereas, Fuller and Everett, Engrs., of New York City, were retained to design and supervise construction of the complete project and are so doing at this time.

In another paragraph it was noted that "Fuller and Everett were serving with Mr. Bunker as engineers on the Bogota project." We understand that Mr. Bunker was selected by the Columbian governmental authorities to collaborate with Fuller and Everett on the design of the filtration plant, because of his long experience and thorough knowledge of water treatment in tropical and semi-tropical America.

The correct statement is that Mr. Bunker and Messrs. Fuller and Everett collaborated on the filtration plant design and are co-signers of plans and specifications. Supervision of all construction for the entire project has been assigned Fuller and Everett, with Mr. Bunker continuing as consultant on water treatment.

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Oldest Member of N. E. W. W. A. Dies

Fayette F. Forbes, for 61 years Superintendent of the Water Department of Brookline, Mass., died at his home in Brookline on November 20th. He was 84 years of age.

Born at Buckland, Mass., on May 9, 1851, Mr. Forbes attended the Williston Seminary and the Massachusetts Institute of Technology. He was first employed in making surveys of the Holyoke water works system. Later he became associated with E. S. Philbrick, serving as surveyor in constructing a water works system in Brookline. In 1875, Mr. Forbes was appointed Superintendent of the Brookline Water Department, a position he held until the time of his death.

Elected to membership of the N. E. E.-W. A. in 1885, Mr. Forbes served on the Executive Committee and was a past-president and honorary member. At its 1935 annual convention he was presented a certificate in recognition of his long continuous membership in the association and faithful service to the community which he served for 61 years as Superintendent of Water Works.

Mr. Forbes is succeeded by Walter B. Bushway, formerly Assistant Superintendent of Water at Brookline.

The New Activated Sludge Plant, Menomonee Falls, Wis.

THE MENOMONEE FALLS, WIS. ACTIVATED SLUDGE SEWAGE TREATMENT PLANT

By ROBERT CRAMER, JR.*
Milwaukee, Wis.

IN March, 1935, the Village of Menomonee Falls, Wis., completed and placed in operation a sewage treatment plant, employing the activated sludge process with mechanical aerators and with an automatically controlled gas engine driven generator-set utilizing digester gas.

The plant is designed for an ultimate population of 1,800, although the present contributing population is only 1,300 persons. The activated sludge process was chosen because Menomonee Falls is located but a few miles from the City of Milwaukee and the sewage from the town is discharged into a small stream, the Menomonee River, which flows through the heart of the City of Milwaukee.

Features of Design

Pumps—

The influent sewage enters a wet well from which it is pumped through a bar screen to the primary tank. The sewage pumps are arranged so that the varying levels in the wet well and the head-capacity characteristic of the pumps operate together in such a manner that the pump discharge is zero at the minimum wet well level and a maximum at the high level of the well. Each of the two pumps deliver 150 gallons per minute when operating under the lower head. The rate of flow through the plant thus fluctuates with that of the income sewage

Primary Tanks

The primary tank is rectangular, being 8′ x 16′ x 8′6″ water depth. The sludge removal equipment is of the straight line type, manufactured by the Link Belt Co. The primary sludge is removed from the sludge hopper by a plunger pump manufactured by the Chain Belt Co.

Mechanical Aerators

The aeration tanks are two in number and square in plan, 16′ x 16′ x 9′8″ water depth, with 2′0″ fillets in the lower corners. Stop gates are provided to enable the operation of either tank alone or of the two in series, the latter method being normally used. The tanks provide a combined volume yielding an aeration period of 4.92 hours at 144,000 g.p.d. sewage flow with 20 per cent return sludge. Return activated sludge may be fed to either aeration tank or to both in any desired proportions, return being normally to No. 1 aerator. Control of the return is effected by specially designed butterfly valves located near each aerator and operated from the aeration tank bridge, with facilities for visually observing the rate of return sludge flow. The aerators were supplied by American Well Works.

Final Tanks—

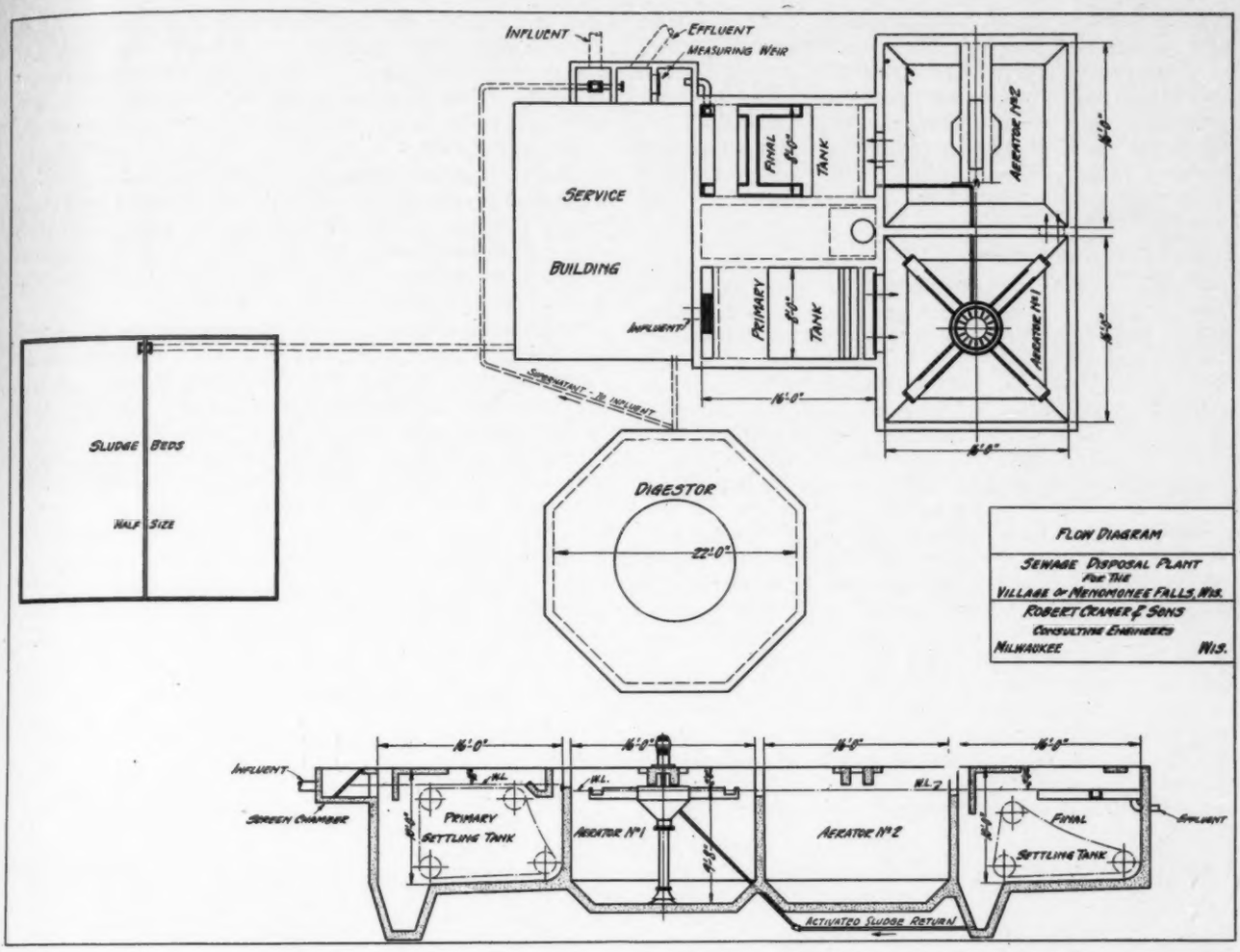
The final sedimentation tank is rectangular, 8′ x 16′ x 8′0″ water depth and equipped with straight line sludge collecting mechanism, by the Link Belt Co. The outfall weirs are structural aluminum troughs arranged in the form of the letter "H," providing long weirage with a drawoff rate of 6,000 gallons per foot of weir per day. The effluent weirs are connected to an outfall well which discharges to the Menomonee River.

It will be noted that the final settling tank is slightly smaller than the primary. The detention period based on the average flow is only slightly over one hour. On the basis of operating results at Fort Atkinson, Wis., is was found desirable to make the detention period in the final settling tank low, since an activated sludge in good condition would settle out in considerably less time than this and would only tend to become stale if retained a longer period. If the activated sludge is not in good condition, longer settling periods do not help this condition but tend to aggravate it through increased staleness of the sludge.

Sludge Waste and Return—

The facilities provided for the return of activated sludge are especially noteworthy and are an exclusive feature of the American Well Works aerator. Utilizing the hydrostatic head available between the surface of the liquor in the final sedimentation tank and the depressed surface of the liquor within the orifice cone of the aerator, the activated sludge from the hopper of the final sedimentation tank returns by gravity to the aerator. It is introduced at a point just above the depressed liquor level within the aerator cone.

*Robert Cramer and Sons, Engrs., Milwaukee, Wis.



Plan and Flow Diagram of Menomonee Falls, Wis., Activated Sludge Plant.

The piping is arranged with a single sludge pipe leading from the final tank sludge hopper to a small wet well, where the pipe is provided with a tee on a vertical run. The side outlet of the tee connects to a sludge pipe leading to the aerators, which in turn branches, one branch to each aerator. A gate valve and a butterfly valve in each branch serves to regulate the return sludge flow.

The upper outlet of the tee in the small wet well is provided with a slip pipe with a V-notch in the side through which waste sludge may flow and spill into the wet well. By adjusting the butterfly valve and the slip pipe, the return and waste may be regulated. The waste is pumped from the wet well by the primary sludge pump, which is operated by a float switch in the wet well. This system eliminates the necessity of running a return sludge pump continuously, with a considerable saving in power, and offers the additional advantage of a very easily controlled and practical method of sludge return. It is only applicable to smaller plants such as those serving up to 4,000 persons, but in such cases it serves to make this phase of plant operation nearly automatic—an advantage where trained operation is usually lacking.

Digester—

The digester at Menomonee Falls is octagonal in plan, 21 ft. on the short diameter and 10 ft. deep. It is provided with a fixed cover with supernatant overflow chamber and equipped with a gas holder in the center of the cover, which provides gas storage for the gas engine generator set. The digested sludge is air dried on two sand beds each 40 by 22 ft. 6 in.

Gas Engine-Generator—

The gase engine generator-set is rated at two KW. full load, and is provided with full automatic controls. The generator is of the induction type and by means of varying pressure as the gas holder rises and falls, is made to deliver more or less energy in parallel with the public service power supply. Thus at all times is all of the gas utilized substantially at the same rate it is produced. This system of gas utilization is a patented feature developed by the engineering firm which designed the plant.

Operating Results

The data given here was gathered during a typical period of dry weather flow when the plant was in normal operation, and followed an extended summer period of similar conditions. The plant does not afford technical supervision and routine laboratory control; therefore, the data is that obtained during a test run to determine performance characteristics and results. The methods employed and the data obtained are set out below and in the accompanying tabulation.

Character of Sewage—

The sewage entering the plant is almost entirely domestic in character, with no appreciable volume of industrial waste. It reaches the plant in a fresh condition and is subject to but little dilution during dry weather.

Operating Routine—

The plant is operated by the Village Street Superintendent, who necessarily spends the major part of his

time on other duties. The automatic and semi-automatic features of the plant embodied in the arrangement of the sewage pumps and the sludge return permit meager supervision to an unusual degree. The operator normally spends approximately an hour and a half per day at the plant, engaged in cleaning the bar screen and pumping primary sludge, which is the only work done on the plant other than minor chores of sweeping and cleaning.

Test Run Procedure—

During the test run a definite routine of control observations was established. Sewage flow was metered by a temporary 90 degree V-notch weir observed periodically at short intervals.

At the beginning of the run the aeration tank liquor contained 1,800 p.p.m. of suspended solids. This was reduced by wasting sludge excessively for three days, lowering the suspended solids to 750 p.p.m. The concentration was then again built up until by the end of the run the mixed liquor contained 2,000 p.p.m. suspended solids. This procedure was adopted for the purpose of establishing the effect of mixed liquor concentrations and to establish the ability of the aerators to support high concentrations of solids. At the conclusion of the test (during the period elapsing between taking of the last B.O.D. samples and the examination of these samples after incubation), the value of 2,000 p.p.m. mixed liquor suspended solids was attained. At that time a dissolved oxygen survey was made of the aeration tanks. Samples, taken from every part of the tanks, all showed a substantial content of dissolved oxygen thus demonstrating that the aerators were supplying oxygen well in excess of the requirements of the mixed liquor. This is especially noteworthy in view of the fact that many mechanical aerator installations have experienced difficulty in maintaining an excess of dissolved oxygen with suspended solids concentrations in excess of 900 p.p.m. in the mixed liquor.

The high mixed liquor concentrations above referred to were successfully aerated with the aerators operating but 75 per cent of the time, the motors being controlled by time switches set to a 15 minute cycle and by means of which the aerators could be run for any desired period of the cycle and remain idle for the balance.

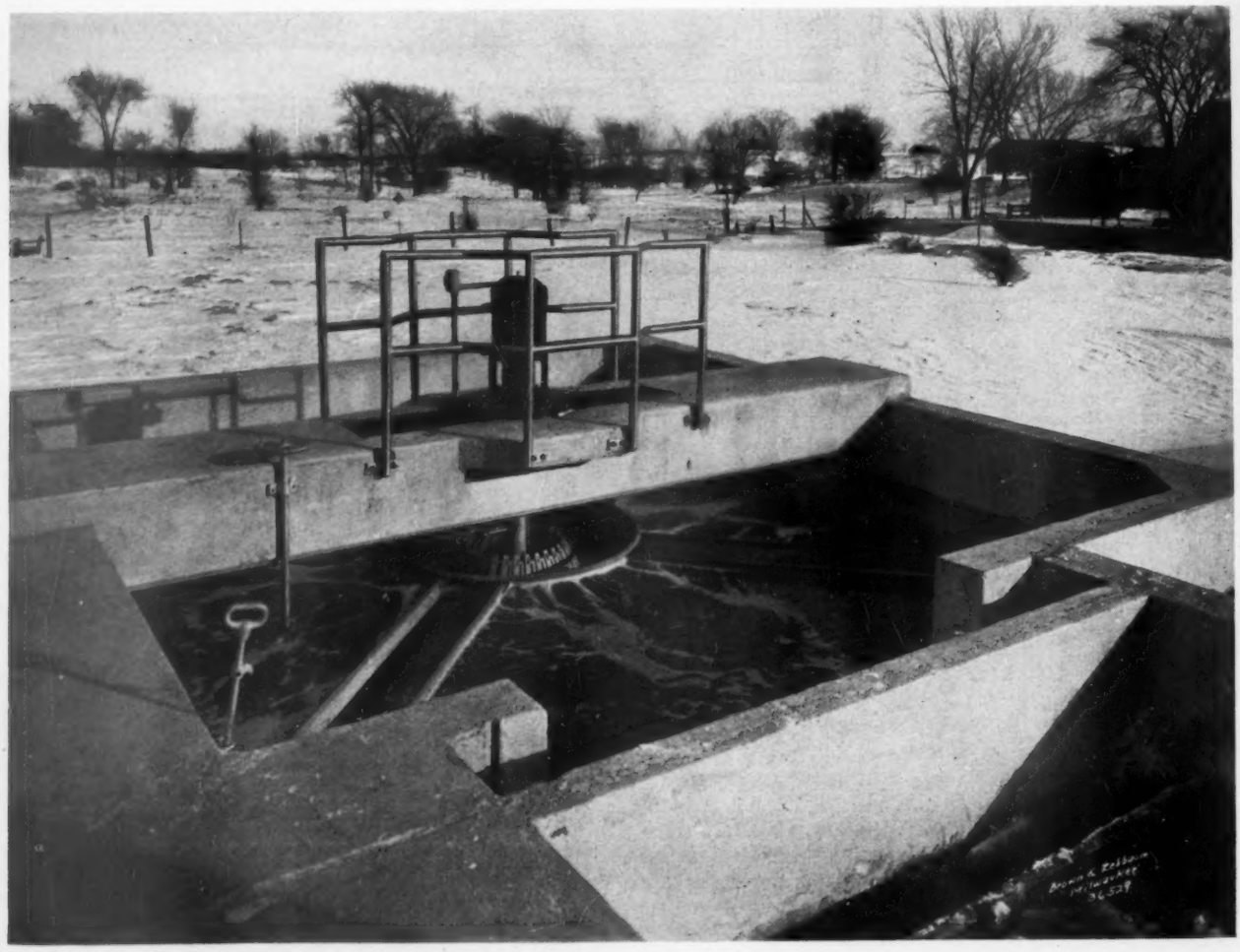
Total energy consumption of the aerators is a computed value based upon the manufacturer's hydraulic laboratory tests of the units. The plant switchboard was not equipped with facilities for metering the power input to the aerators separately.

Analytical procedure was in accordance with accepted methods and with the latest Standard Methods of the American Public Health Association so far as possible, the only departure from strict conformity being in the incubation of the B.O.D. samples. It was necessary to incubate these samples in a water bath subject to some variation in temperature between the limits of 20 and 23 degrees C. Proper corrections were applied to compensate for departures from standard temperature.

Results and Discussion—

The operating results of the test run are summarized below:

Sewage Flow (average).....144,000 gallons per day.
(111 gal. per cap. per day)



American Well Works Aerator, One of the Two Units at the Menomonee Falls, Wis., Activated Sludge Plant.

Suspended Solids:
- Raw Sewage ..... 194 p.p.m.
- Final Effluent ..... 2.9 p.p.m.
- Reduction ..... 98.5 per cent

Oxygen Consumed:
- Raw Sewage ..... 78 p.p.m.
- Final Effluent ..... 17 p.p.m.
- Reduction ..... 78 per cent

5-Day B.O.D.:
- Raw Sewage ..... 172 p.p.m.
- Final Effluent ..... 3.5 p.p.m.
- Reduction ..... 98.2 per cent

Suspended Solids in Mixed Liquor. 1,280 p.p.m. average
Sludge Index ..... 99 (Mohlman)

Throughout the test run the effluent from the plant was crystal clear and with the fresh odor of potable water, with an exceptionally small volume of pinpoint flock being drawn over the final tank weirs. It was possible to work in very short retention periods of settled sludge in the final tank which allowed a very shallow sludge blanket; at all times the flights of the scraping mechanism could be seen at the bottom of the tank.

The excellent results obtained are indicative of the high degree of treatment obtainable with the expenditure of very modest amounts of electrical energy. The ability to control the energy input, with precision, through intermittent operation made possible by the low starting torque of the aerator, enables the operator to achieve the greatest economy by regulating the power input to suit the requirements of the waste treated.

At the time of writing this article the gas flow was not yet sufficient to operate the engine generator unit continuously. However, a gas flow of 1,200 cubic feet per day, which is expected from this plant, will produce approximately 48 KW. hours per day which is only slightly less than the power needed for aeration. A similar system of gas utilization in operation at Fort Atkinson, Wis., for over a year has produced an average of 80 per cent of the power necessary to operate the disposal plant, exclusive of sewage pumping.

The large input of oxygen obtained (apparently as the result of the very fine air bubbles produced) allows of high concentration of suspended solids in the mixed liquor, of the order of the concentrations possible with diffused air. This ability to support such concentrations is of the utmost importance in treating strong institutional or industrial wastes with reasonably short aeration periods as well as providing a high margin of safety in plants where technical supervision and control are deficient. Both, through the reserve capacity provided by high solids concentrations; and, through the wide range of allowable fluctuations in mixed liquor concentration, a high margin of safety is provided, that becomes of especial value in plants which are subject to meager supervision or control.

The Menomonee Falls plant was designed and its construction supervised by Robert Cramer & Sons, Consulting Engineers of Milwaukee, Wisc.

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Illinois Holds 3rd Conference On Water Purification

The 3rd Annual Illinois Conference on Water Purification, sponsored by the State Health Department and the Southern and Central Illinois Water Treatment Operators Association, which was held at Springfield, Ill., was attended by a record number of operators—69 plans being represented amongst the 131 registrants.

Officers elected by the Association are: President, Ned Atkinson of Vandalia, Ill.; Secretary, Clifford Fore of Carbondale, Ill.; Corresponding Secretary, Clarence W. Klassen, Acting Chief Engr., Illinois State Dept. of Health.

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H. L. Shaner Dies Suddenly

Capt. H. L. Shaner

Harry L. Shaner, well known and admired, Commissioner of Public Works at Winston-Salem, N. C., died suddenly at his home on November 20th, in his 56th year.

Mr. Shaner, an engineer graduate of the Virginia Military Institute (1899), first served as Assistant City Engineer of Lynchburg, Va., and became City Engineer in 1904. This position he held until 1918 when he became Commissioner of Works at Winston-Salem, N. C.

He served in the army as Captain during the World War, and there won the familiar title of "Cap." by which he was best known to his many friends.

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Georgia W. & S. Ass'n Holds 4th Annual Short School

The Georgia 4th Annual Operator's Short School was held in Atlanta, Nov. 6th-8th., under joint auspices of the Georgia Water and Sewage Operators Assn.; Georgia School of Technology, and Georgia State Department of Health. The attendance was 125, and 50 Class "C" and 25 Class "C" Certificates were awarded.

Amongst the lecturers and their topics were the following:

W. H. Weir—"Methods of Water Purification."
A. J. Smalshaf and O. W. Gray—"Corrosion Control."
J. L. Daniel—"Water Plant Chemistry."
H. A. Wycoff—"Water Bacteriology."
Paul Weir—"Taste and Odor Control."
M. T. Singleton and G. R. Frith—"Sewage Treatment."
H. P. Powell—"Swimming Pools."

Officers named for 1935-36 were:

President, Odell Gray (Thomasville); Vice-Pres., Carl Alexander (Rome); Vice-Pres., Lewis De Jarnette (Atlanta); Sec'y-Treas., Lewis Simonton (Griffin); Chairman of Executive Committee, Paul Weir (Atlanta).

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L. N. Thompson, St. Paul, Minn., Elected Director of A. W. W. A.

At the recent 25th Annual Meeting of the Minnesota Section of the American Water Works Association, Leonard N. Thompson of St. Paul was named to represent the section on the National Board of Directors of A.W.W.A. Mr. Thompson is General Superintendent and Engineer of the St. Paul Water Department.

Other officers named were the following: Chairman, Edgar W. Johnson (Minneapolis); Trustees, Ross A. Thuma (St. Paul); Felix Seligman (Duluth); Eugene Schwarz (Rochester); E. M. Grime (St. Paul). R. M. Finch, District Manager for Wallace and Tiernan Co., who has served the section for several years as Secretary and Treasurer, was re-elected to this office.

The 25th meeting, held in St. Paul, was voted the most successful ever held by the Minnesota Section.

AN IMPROVED METHOD RATING AND SAMPLING WELLS

By PAUL F. HOWARD, M.S.*
Boston, Mass.

P. F. Howard

IT is oft-times desired and of importance to ascertain the quantity and quality of water yielded by an individual driven well connected to other wells of a water system. Experience has shown that analyses of samples of water taken from individual wells by means of a hand pitcher-pump give false and meaningless results, especially in relation to the iron content. Likewise the yield of an individual well by means of separate pumping furnishes but little if any information as to the yield of the individual well when ganged together into a common system.

The writer's firm was engaged, some two years ago, to investigate a water supply of the city of Attleboro, Mass., from about 90 driven wells. During the course of the work it became desirable to determine the yield of each individual well and the iron content of the water from each individual well under normal operating conditions. This was done by a device which we have called a Well Rater and Sampler. The device (see cut) was connected to the top of the well by a 2½ inch wrought iron pipe about 2½ feet long. At this point a 1¼ inch centrifugal pump was connected by the proper fittings and discharged through a 2 inch pipe. On the suction pipe a hand pump was attached to prime the pump. A 2 inch orifice flow meter was inserted in the discharge line and by means of a manometer the rate of flow was determined. The amount of the draw-down of the well, when connected to the well field, was determined by means of a mercury U tube connected to a small tube attached to the well cap, the tube extending into the well to a depth sufficiently great so that the end was at all times below the level of the water outside of the well.

Before the Well Rater and Sampler was connected to the well the permanently installed valve on the suction line was closed. After the device was connected this valve was opened and the well was observed under actual working conditions—i.e., while it was being pumped along with the other wells by the large pump in the pumping station. The drawdown was revealed by the reading of the manometer connected to the tube in the well and recorded. Thereafter, the permanently installed valve was closed and the centrifugal pump started, the rate of pumping being controlled by a valve on the discharge line. As the discharge increased the drawdown increased, thus producing a deflection on the manometer. When the manometer reading was the same as that observed under the actual working conditions, as just described, the yield of the well was assumed to be the same. The quantity being pumped was then determined by observing the deflection of the flow manometer on the pump discharge line. The results represented the actual amount of water that the well was contributing from the field as a whole when under actual pumping conditions. Samples of water for analyses were then taken at the point of discharge.

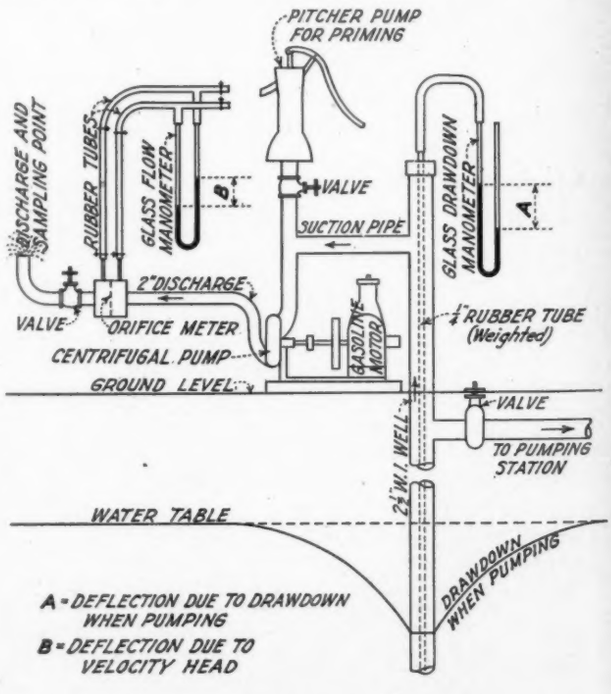
*Whitman and Howard, Engrs., Boston, Mass.

By careful operation of the valve at the discharge end of the pipe the yield of the well was brought gradually up to the original yield at the beginning of pumping. Thereby higher velocities than usual or ordinary in the pipe well were provided. Any excess velocities would, of course, free scale, rust and other matter and give false samples. The flow manometer in this particular instance was connected to the 2 inch orifice flow meter. The liquid used to determine the differential pressure can be of any specific gravity desired depending upon the rate of flow to be measured. The most common is mercury for high flows and carbon tetrachloride (Specific Gravity 1.60), for low flows.

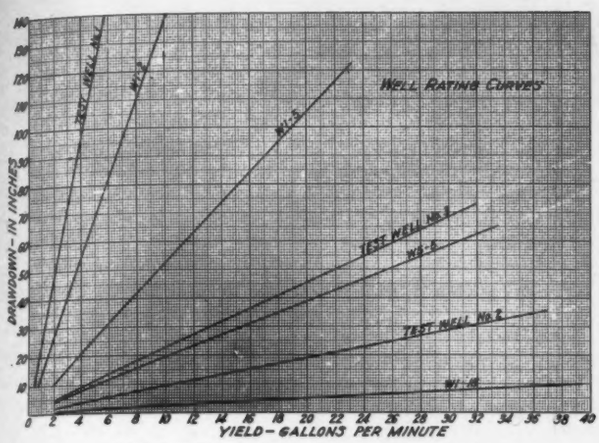
One side of the mercury U tube was connected to the tube in the well and filled with water from the surface of the mercury to the water level in the well, care being taken to remove all air. The other side of the U tube was left open to the atmosphere.

A Specific Case

The following specific example will serve as an illustration. After the Well Rater and Sampler had been properly set up and connected to a well the mercury U tube was connected to the tube in the well. There was an initial deflection of mercury of 3 inches which represented a water column of 40½ inches, the distance from the water table to the mercury surface of the U tube. After an equilibrium had been reached the well was connected to the field and the mercury in the U tube deflected an additional amount corresponding in general to the distance the water table dropped outside of the well and specifically to the drop in pressure in the wall. In this case the total deflection was 4¼ inches or a difference in deflection of 1¼ inches which equal 17 inches of water as the drawdown within the well.



WELL RATER AND SAMPLER
The Hook-Up of the Well Rater and Sampler.



Typical Well Rating Curves Obtained.

The well was then shut off from the other wells and the small pump started. The discharge valve on the pump was then opened slowly increasing the yield of the well until the drawdown deflection of mercury showed 4¼ inches. After this point was reached the flow manometer was observed to have a deflection of 1⅝ inches of mercury which on this meter represented a flow of 20.1 gallons per minute.

The yield of the various wells in relation to the drawdown was plotted on arithmetric paper and the yield of each well was found to be directly proportional to its drawdown. The yield of the various wells varied from 1 to 25 gallons per minute and the drawdown varied from 5½ to 26 inches.

This device has been made use of in installing new driven well fields. By its use we have been able to predict reasonably well the drawdown or vacuum to be expected in a system of driven wells and to eliminate uneconomic wells, which have a low yield in relation to the drawdown. Also with open end wells it has been possible to determine at what yield a well will throw sand sufficiently to result in the filling up of wells by sand. The equipment will probably be found to have other uses also.

Acknowledgment—The above paper was presented before the New England Water Works Association, at Providence, R. I., Sept. 19, 1935.

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A Modern Turbidimeter

By GRANT LAUGHLIN

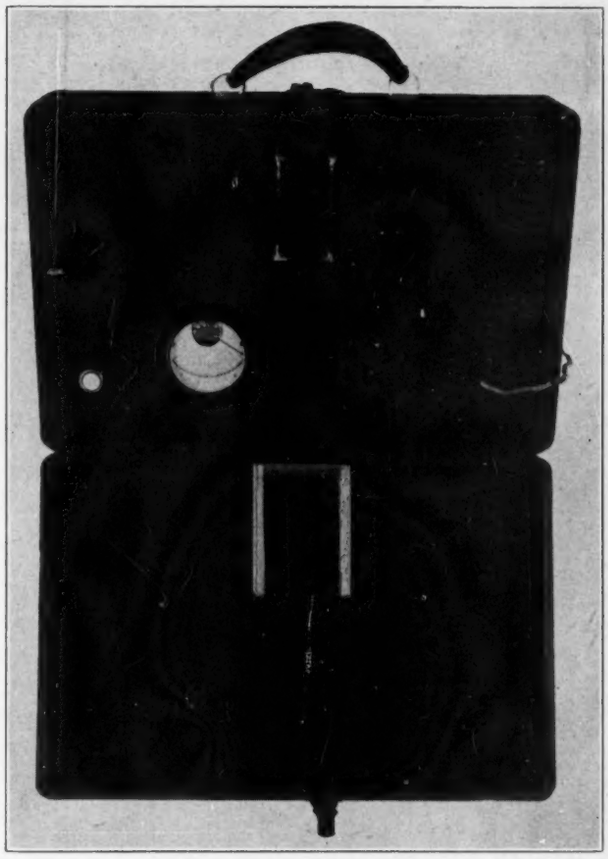
Filtration Equipment Corp.
New York, N. Y.

An accurate and easily operated turbidimeter is almost indispensable in a chemical treatment sewage plant, where clarification is the prime object, and where, either in laboratory flocculation tests or in actual plant operation, clarification efficiencies can readily be put on a standard basis of comparison.

The principles involved and the instrument shown here has been developed at Dearborn's and Perth Amboy's chemical treatment plants to meet the requirements of the most critical laboratory. The usual guess-work associated with turbidimeters has been eliminated and the all-important factors of accuracy, sensitivity, and ease of operation have been given consideration. It is compact and portable, weighing about ten pounds, and has space for carrying a pair of glass cells.

All variables, such as fluctuating illumination and photronic cell fatigue, have been removed by specific circuit design. Comparisons are made against distilled water as having zero turbidity. Operating procedure consists of placing a cell filled with the sample in front of the light beam (front cut-out), pressing the push-button on the panel, and reading the turbidity directly from the calibrated scale.

There are two scales: one reading 0 to 3000, and another, designed for high sensitivity, and reading 0 to 100. The accuracy and sensitivity of this last scale is such that a differential of 3 p.p.m. in turbidity will deflect the needle nearly one-eighth of an inch. Each range has a separately designed circuit, and the change from one to the other is done by a convenient switch on the panel.



Electro Turbidimeter. Left: Light Control Rheostat Switch; Center: Glass Cells. Right: Push Button, Range Selector, Light Turbidity Scale Zero Adjuster.

Through use of the instrument, treatment efficiencies are revealed by the observed rates of clarification (turbidity reduction) following the chemical conditioning stages of precipitation processes. The electric-eye has no personal equation with which to contend.

Acknowledgment.—The author is indebted to Mr. Edmund Miller, Supt. Sewage Treatment, Dearborn, Mich., who conceived the basic design of this turbidimeter and successfully employed the principle in chemical dosage control at Dearborn.

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Dry Ice as Well Cleaner

Dropping 200 pounds of dry ice down a well casing and thereafter closing the well tight, a well driller has found effective in opening of well screens. As the dry ice "melts," the liberated carbon dioxide gas builds up a pressure which forces the water in reverse of usual flow out through the well screens and surrounding sands or gravel. The pressure is watched on a gage on the well and the relief valve is opened to avoid pressures above 150 lbs.—*Monsanto "Chemical Topics."*

SHORT SCHOOLS AND LICENSING

By EDW. S. HOPKINS*
Baltimore, Md.

ALTHOUGH fundamentally different in character, it is necessary to consider the functions of short schools and operator licensing regulations conjointly. This condition has arisen because frequently the subject of the short school training is to enable the water or sewage plant operator to meet present or future license requirements. This places the responsibility for maintaining operator efficiency in the majority of cases upon the short schools, such as have already been established in 25 states.

Certain national technical societies have been, or are, studying the problem of basic training for plant operators. In a recent report (2) the Sanitation Division, American Chemical Society, has clearly indicated the fundamental scientific training necessary to adequately control filtration processes. This report recognizes the value of experience but states:

"Instruction schools and conferences for operators, now holding positions, have been helpful but cannot be considered as an equivalent for well educated and properly trained men who have made a specialty of water purification and sewage treatment plant operation. Attempts to simplify and minimize the theories and principles involved in the complex problems of sedimentation, colloidal suspension, nitrification, hydrogen ion concentration, anaerobic and aerobic digestion, filtration, and the innumerable chemical reactions and biological changes, may lead to a superficial view that may be more harmful than helpful."

A committee report of the American Public Health Association (3) in discussing the competency of plant personnel, believes that "sound operation is based upon fixed responsibility subject to the action of the reviewing authority." The necessity of broad technical training is also emphasized and experience in plant operation is evaluated as a very important factor.

In a preliminary report (4) of a committee of the American Water Works Association, created to study the problem of licensing, advocates certain qualifications for plant personnel. It is of interest to note that, whereas, this report insists upon the utilization of highly trained individuals, it also provides for those with experience and ability who have a minimum of formal education.

It is clearly indicated that the task of the short school should be definitely limited to the training of plant operators now in service, keeping them in touch with the field in general, and with new developments.

Jordan (1) in a recent article states: "The combination of licensing and water works schools, on the one hand, trains men for the improvement in water works supply service for which every city and state should strive, and on the other hand assures to water works personnel the degree of security and community respect to which any hardworking, willing employee is entitled."

With this belief the writer disagrees. It must be granted that the assistance given to the individual by short school training is definite and tangible; but, the value derived from a licensing system is not at all clear.

The previously quoted national society reports establish basic qualifications for plant personnel. It must not be forgotten, however, that the plant operator is, as a usual thing, appointed by local authority. It is believed, therefore, that the work of the national societies should be to educate local executives as to proper operator qualifications, rather than to support bureaucratic control through state agencies. A community educational campaign should, in the long run, provide sounder assurance of retention of qualified men in office than will the pressure of a license fiat.

A consideration of the available data in the literature leads to the conclusion that the necessity for licensing of operators has not been proven. New Jersey and Michigan have statutes which require the registration of plant operators. Licensing in West Virginia is under regulation of the Health Council. Texas and Georgia have a voluntary system, and Ohio operates under an engineer's registration act. A committee in California has recently reported in favor of the voluntary system.

Regulation would not improve the "professional" standing of the technical operator or raise to any degree the standards. The remedy lies in educating the appointing authorities to a realization of the fundamental sciences involved, with a resultant appreciation of adequately trained professional personnel. The legal advisor to the smallest town is a trained lawyer, the health officer usually a trained medical doctor. Why then, should economic objection be raised to placing professional personnel in charge of purification plants as an adequate safeguard to the public health? Part time supervision of the technical operator by a highly trained man, apart from the reviewing authority, seems the best method of elevating the plane of operators. An educational program in this direction is a task for the sanitary engineering bureaus of the various state departments of health, and technical societies or associations.

Greater protection of the public health can be secured by other means than licensing. The fact remains that potential elements of political control enter into such a system, particularly if yearly license renewals are enforced. Most state departments of health already have authority to regulate and supervise the efficiency of plant operation. Therefore, if possessing the power to file charges of inefficiency, incompetentcy or negligence against plant operators (with the *local* appointing authority) much can be done to maintain health safeguards.

Much more of a lasting effect may be secured by this type of activity than by a license system, the standards of which must of necessity be adjusted to fit a variety of existing conditions. Further, education of the public to appreciate the plant operator's responsibility should be considered of first importance. When this has been accomplished professional status and health protection will be assured.

*Prin. Sanitary Chemist, Montebello Filters, Baltimore, Md.

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THE PATENT SITUATION IN SEWAGE TREATMENT

By PAUL HANSEN, C.E.*
Chicago

THIS is written from the point of view of a practicing engineer having no personal interest in any patents relating to sewage treatment, but one who is called upon by clients to design sewage treatment plants that may embody patented devices and processes. From such a point of view patents may be divided into seven classes:

1. Patents that are valid and useful and for which a reasonable royalty is charged.
2. Patents that are valid and useful but for which an unreasonable royalty is demanded.
3. Patents that are unexpectedly obtained and unexpectedly affirmed by the courts.
4. Patents of doubtful validity, but useful, for which a small royalty is demanded.
5. Patents of doubtful validity, but useful, for which a large royalty is demanded.
6. Patents on which royalties are covered in the price of equipment.
7. Patents on which royalties are not covered in the price of equipment.

Valid and Useful Patents with Reasonable Royalties:

The first group of patents causes the practicing engineer very little trouble. By "reasonable royalty" is meant one which does not seriously affect the relative economy of a device or process as compared with an alternate possibility of the same or nearly the same suitability. A typical instance of this is the patent on the Imhoff tank. The royalty demanded was reasonable and easily applied. The novelty of the device was such as to raise little question in the minds of most engineers as to the validity of the patent.

Valid and Useful Patents with Unreasonable Royalties:

The second group causes little trouble provided it is known in advance of design that the patents are valid either as a result of common acceptance of their royalty or by affirmation of the courts. There are in most cases enough processes and devices to choose from so that a sewage treatment problem may be reasonably and economically met by using other processes and devices which do not infringe any existing patents or on which royalties are reasonable. This very situation tends to prevent a demand for excessive royalties.

Patents Unexpectedly Obtained and Affirmed by Courts:

The third class is the most troublesome, especially when accompanied by demands for unreasonable royalties. Most engineers having to do with sewage disposal are familiar with the unexpected affirmation of certain claims of the septic process patents in the Saratoga Springs case and the subsequent attempts of the owners of these patents to collect unreasonable royalties, principally from small towns. To defend themselves against the claims of the owners of the septic process patents, engineers and municipalities formed an "Association for the Defense of Septic Process Suits." It would have been quite possible to avoid or circumvent the septic process patents. Many well informed engineers were never convinced of the value of the septic tank process and subsequent inquiry stimulated largely by the experiments at Columbus, O., in 1904, has shown that the septic tank process has such great limitations for large scale use that septic tanks are now obsolete in municipal practice.

A more recent example is the affirmation of the validity of the activated sluge processes by the U. S. District Court of Milwaukee. While the validity of the patents has been in part upheld by the U. S. District Court of Appeals, there has been no accounting nor collection of any royalties. A number of cities which have been sued have settled out of court. Activated sludge is a useful process of increasing economy, by reason of refinement and improvements made by engineers generally, and it has a wide field of applicability. Most of the early patents have expired or are about to expire in November. Hence the use of the process is not likely in the near future to be restricted by patent royalties.

Patents of Doubtful Validity Involving But Small Royalties:

There are some patented processes or devices of doubtful validity. If royalties are small or are unobtrusively covered up in the sales price, engineers are not likely to make much effort to avoid them, especially when the patent rights do not act to seriously restrict competition.

Patents of Doubtful Validity Involving Large Royalties:

The fifth class is fortunately not a large class and in most cases the patent claims can be circumvented. Where it is desirable to use a process covered by such patents the engineer should inform his clients as fully as possible regarding the situation and carefully weigh with them the relative merits of paying the royalties asked or challenging the validity of the patents in court. In important cases the cost of litigation may be shared by an association of communities as was done in combating the septic process suits.

Patent Royalties Covered in Price of Equipment:

The sixth group is a large one and may include the other groups, and it is ignored by engineers much more than it should be. The engineer often authorizes payment for these royalties but is not aware of it. He generally does not know what patents are involved nor the amount of the royalties. Such royalties as may be involved are taken care of in the specifications by a requirement that the contractor shall save the client harmless from all claims of patent infringement.

The manufacturer, on the other hand, is much concerned with patents which affect apparatus manufactured by him. If the patents are his own or if he has exclusive control of them he is apt to feel righteously entitled to the benefits of such patents. If he is constrained to pay to competitors, patent royalties on some feature of his manufactured articles, he is apt to regard such patents as "nuisance" patents or to use a harsher phrase, "stick up" patents. If the royalties demanded are relatively small the manufacturer may find it cheaper to pay them than to challenge the validity of the patents in the courts.

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If, however, the royalties are relatively large and the validity of the patent is questionable then it may prove worth while to resort to litigation. But such litigation is very expensive.

In the United States, obtaining a patent is a relatively easy matter. This is due in part to the persistence of an old but now outworn national policy of encouraging invention as a means of building up industry. No doubt this policy did stimulate industry in the earlier days, but nowadays it tends to retard industry, primarily because industry must carry a large burden of expense in making numerous patent claims for self-protection and in paying royalties on or combating in the courts many patents that represent nothing fundamentally new by way of invention. Many are mere combinations of processes and devices long known and in use.

Inventors are no doubt entitled to protection in the exploitation of their inventions, but this protection should be administered with due regard to essential justice and to general public interest.

That engineers and their clients may at least know what burden of expense for patent royalties they are called upon to meet engineers should inform themselves more fully as to the status of patents on which royalties are covered up in the selling price of equipment, and they should also inquire into the methods of exploiting such patents, because there is a possibility that such exploitation may be carried on in a manner to unduly restrict competition against their client's interests.

Patent Royalties Not Covered In Price of Equipment:

Some patents do not relate to equipment used but do relate to processes which are embodied in plans and specifications prepared by the engineer. Manifestly it is improper and unjust to require the general contractor to assume responsibility for such patents especially if the patents are issued in this country after the works are built or if the patents are of doubtful validity. In case of valid patents it is preferable for the client to make direct settlement of patent claims and to negotiate such settlement prior to the preparation of plans and specifications. In this connection the services of a competent patent attorney are often helpful.

If the exact amount of royalties to be paid is known and fixed there can be no objection to requiring the contractor to include a designated sum in his bid to cover such royalties and under some conditions on public work this method may constitute a convenience.

The patent situation in the sewage treatment field does not appear to be serious at this time. Important activated sludge patents have expired or are about to expire. There is now sufficient available choice among sewage treatment processes and devices to permit engineers to avoid or circumvent patents when the demand for royalties is unreasonable or as a corollary to this, the existence of such latitude of choice tends to force reasonable royalties for patented processes and devices.

Patents relating to sewage treatment have become more numerous in recent years so that the problem of dealing with patents from the engineer's point of view has become more difficult and complicated. Engineers must devote more attention than was formerly necessary to such patents. However, in complicated situations, especially those involving patents of doubtful validity, or excessive royalties, engineers can best serve the interests of their clients by advising the employment of a competent patent attorney.

Acknowledgement—This paper was presented before the American Society of Municipal Engrs. at Cincinnati, O.

Sanitary Waterboard of Pennsylvania Replies to Pittsburgh Resolution on Stream Pollution

In our November issue there appears on page 400 a brief item under the caption "Pittsburgh Starts Important Action, Seeking Abatement of Water Pollution."

The report refers briefly to Resolution No. 225 passed by the Council of Pittsburgh and forwarded by Mayor McNair to the State Sanitary Water Board and Department of Health of Pennsylvania, which called on these regulatory authorities and the Attorney General's Office, "to take such steps as are necessary to provide prompt, reasonable and continuous relief to affected communities (suffering from stream pollution from coal mine drainage and specific industrial wastes—Ed.) lying along the Allegheny River and its tributaries." In this action by Pittsburgh, other affected neighbor communities and private water companies have been invited by Mayor McNair to join.

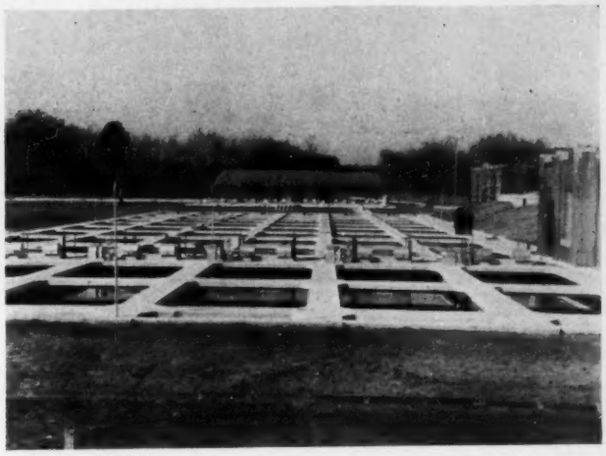
To WATER WORKS AND SEWERAGE, now comes a copy of the pointed reply from Dr. Edith Mac Bride-Dexter, Secretary of Health and Chairman of the Sanitary Water Board of Pennsylvania, to the Pittsburgh authorities. The letter, addressed to Mayor McNair, contains the following disarming paragraphs:

"When your communications are laid before the Sanitary Water Board I would like, at the same time, to let the Board know the progress which Pittsburgh has made in its sewage disposal plans." . . . "Recently I attended a meeting in Wheeling, West Virginia, where considerable attention was given to the abatement of pollution of the Ohio River, so I would like to have some definite evidence from you that Pittsburgh is making progress toward treatment of its sewage, in case inquiries come from down stream State Health Department, just as you wish information concerning abatement of pollution above your Pittsburgh water works."

In an accompanying letter to WATER WORKS AND SEWERAGE—addressed to L. H. Enslow, Editor, the following information comes from Dr. Mac Bride-Dexter:

"The Pittsburgh resolution enumerates specific sources of pollution of the Clarion River. As a result of cooperation between this Department and the Leather Tanning Industry, and insistent pressure of the *present* Sanitary Water Board (italics are ours), construction is already under way of a tannery waste treatment works at Wilcox. For the St. Mary's tannery, plans are completed by the operating company." . . . "The Johnsonburg paper mill has, for many years, treated most of their waste waters, and the major source of pollution remaining is that from sulphite waste waters for which, we understand, no practical process for successful treatment is at hand. But, under pressure from the Sanitary Water Board, the company has been engaged in extensive, fair sized scale, experimentation which has not been successful." . . . "The chemical plant (cited) has been investigated and is already under orders to revamp their present means of disposal of their wastes so as to abate pollution."

Relative to acid pollution from coal mines, the letter states that in the movement inaugurated by the Penna. Health Department, involving the sealing of abandoned mines, particular attention had been given drainage areas up-stream from the several Allegheny River water works, particularly that of Pittsburgh. Added federal appropriations expected, explained the letter, would give the Pennsylvania Department of Health $1,500,000 to spend in extending mine sealing operations as a work relief measure.



Durham's New Sewage Treatment Works. Under the Glass Sludge Bed Cover in the Background Was Held the "Odorless" Barbecue.

JOINT CONVENTION N.C. SECTION A.W.W.A. AND N.C. SEWAGE WORKS ASS'N.

THE 15th Annual Convention of the North Carolina Section of the American Water Works Association and the Annual Meeting of the North Carolina Sewage Works Association was held jointly in Durham, N. C., November 4th, 5th and 6th. The official registration was something over 140.

Following Mayor Carr's address of welcome the opening session was devoted to a program of sewerage papers, after which Durham's new activated-sludge plant,* containing many unusual features, was inspected.

Odorless Barbecue

A novel feature of the convention was the Barbecue Supper served at the sewage plant under the unique glass roof which covers a part of the sludge beds. The absence of odors, flies and top-coats bespeaks early November weather in the Tar-heel State and reflected the operating characteristics and management of Durham's sewage treatment plant.

President Barbour on A. W. W. A.

On the second night was held the Annual Dinner-Dance, at which President Burchard presented Frank A. Barbour, President of A.W.W.A., who spoke very briefly concerning the "Aims and Activities of A.W.W.A.," this subject being amplified by him the following day during the Business Session.

Mr. Barbour's comments in part have already been the subject of an editorial in the November issue of this magazine. He said that the time had come to consider the social and economic status of members of A.W.W.A.; that some means of increasing the security of faithful and efficient water works employees was to be sought. In this direction, he stressed the value of national and local publicity aimed at keeping the general public aware of the real value of the water works utility and the capabilities of, and service performed by, the water works management and operating personnel. To assist A.W.W.A. members secure local recognition, justly theirs, Mr. Barbour suggested establishment of a Committee on Publicity in each Section of A.W.W.A. One duty of such committees, he thought, should be that of sending out press releases concerning convention proceedings and especially that of sending back to his home town what "Bob Waterman" of the Smithville Water Department said on the floor of the convention of the X.Y.Z. Section of the A.W.W.A.. Also notices concerning the activities of the "Bob Watermans" in the Association, his official capacity et al.—preferably with a photograph for increased effectiveness of the story. Such publicity, said Mr. Barbour, should reflect a general benefit to the water works profession at large by raising the opinion of the public generally, and of specific value to the local official so publicized. He felt that newspapers would be pleased to receive such local publicity items and that the scheme was workable, of potential value, and worthy of the effort.

In addition to efforts to increase the standing of water works officials and nation-wide respect for water departments, productive of less political interference and en-

*[For a description of Durham's outstanding plant see WATER WORKS AND SEWERAGE for October, 1935—an article by W. M. Piatt—Ed.]

Snapped at Durham

From left: (1) C. W. Smedberg, Commissioner of Public Works, Greensboro; (2) R. E. Kirchner, Mueller Co.; (3) E. L. Nance, Sewage Works, Charlotte; (4) J. W. Ivey, Mathieson Alkali Works; (5) L. C. Bird, Phipps & Bird; (6) A. R. Murphy, Wallace & Tiernan Co.; (7) R. M. Rodgers, Supt. of Water and Sewage Plants, Winston-Salem.

H. G. Baity, State Director, P.W.A., Chapel Hill, N. C.

W. E. Vest, Supt. Water and Sewerage, Charlotte, N. C.

hanced security of position, Mr. Barbour commented on the desirability of establishing a form of group insurance for members of A.W.W.A. which would represent a form of old age security and yield a retirement and disability benefit. For this suggestion credit was due Linn H. Enslow, and it was not the fantastic idea that some thought. In fact, an important professional engineering society was at present studying the possibilities of just such a scheme.

Mr. Barbour reported that A.W.W.A. now had a General Policy Committee which was studying ways and means of improving and strengthening the association, and some very real and practical plans should result. To him, it was incredible, and a sad reflection, that of the 12,000 water works systems of America only 860 were represented by having one or more members in A.W.W.A.—the one association nationally representing the water supply industry and its personnel. The reason must be found and the condition remedied. A sure and certain method was that of personal contact; and, if each member would make an effort to bring in one or more members the strength of the "chain" would be surprising. With more members would come more income; and, with the latter, would be possible the carrying out of ideals of officials of the association in respect to a program of bettering the social and economic status of A.W.W.A. members in addition to its technical activities.

Following Mr. Barbour's talk, Mr. Enslow cited concrete cases of the value of local publicity to water works operators, as a fortification against political interference. He suggested that a special Publicity Committee be established in the N. C. Section with this objective in mind. The section voted in favor of the idea.

Baity Voted Appreciation

Amongst the resolutions presented to the membership, was a special resolution expressing appreciation and a vote of thanks of the North Carolina Section of A.W.W.A. and the North Carolina Sewage Works Association to H. G. Baity, for his services and material contribution to the development and the good of the two associations while serving as Secretary and Treasurer, the office from which his present official duties, as P.W.A. State Engineer, made it necessary for him to resign.

New Officers

The following were elected officers for the ensuing year:

President—C. E. Rhyne, Supt., Water, Light and Sewerage, Gastonia, N. C.

Vice-President—J. C. Martin, Supt., Water, Light and Sewerage, Tarboro, N. C.

Secretary-Treasurer—M. F. Trice, State Department of Health, Raleigh, N. C.

Dir. Publications—W. E. Vest, Supt., Water and Sewerage, Charlotte, N. C.

P. W. Frisk was again named Chairman of the Membership Committee and A. O. True, Chairman of the Nominating Committee.

In the final race between Asheville and Charlotte, as the next convention place, out of deference to W. E. Vest for his long tenure of service and membership in the association, Charlotte was voted the 1936 Convention.

Technical Sessions

(President E. D. Burchard, Presiding)

"Operating Costs at Greensboro's Sewage Treatment Plant"—by W. M. Lybrook, Sanitary Engineer, Department of Public Works, Greensboro, N. C.

Mr. Lybrook briefly described the mechanized separate digestion sprinkling-filter plant of Greensboro, designed for a D.W.F. of 3.25 M.G.D. The plant had been in service since 1931 and was at present treating 1.85 M.G.D. average flow from 20,000 people. The plant being designed for twice the present average flow, one of the two filter units was alternately held out of service except during flows exceeding 3.25 M.G.D. Sludge was pumped from primary tanks to digesters 6 times each 24 hours; humus from the final clarifiers to the raw sewage twice daily. Digester contents (maintained at 83 deg. F.) were re-circulated by pumping at times of transfer of crude sludge to the digesters. Due to the large capacity of digesters sludge had been stored therein over winter and drawn in good drying weather. The dried sludge cake was being run through a pulverizer-shredder and that not utilized by the city was being sold at $2.50 per ton at the plant, whereas the cost of production had been only 92 cents per ton.

Laboratory routine involved analyses of samples of crude, settled, filter discharge, final effluent and stream samples three days each week. Operating personnel consisted of two regular 12 hour shift operators and a relief operator. Outside labor was used in sludge handling, and maintenance of grounds and plant. During the 4 years of operation the average B.O.D. values had been crude 143, settle 110, filter dischg. 25, final effluent 20—an overall reduction of 86 per cent. Reduction in suspended solids had averaged 86.7 per cent.

The following averages during the 4 year operating period were of interest:

Coarse Screening per M.G.	0.51 cu. ft.
Grit per M.G.	0.83 " "
Gas Production—	
(a) Per capita per day	0.57 " "
(b) Per lb. of volatile matter added	8.70 " "
(c) Per lb. of volatile matter reduced	12.70 " "
Bone dry sludge per m.g. sewage treated	628 lbs.
Volatile matter (d.b.) crude sludge	60 per cent

C. E. Rhyne, Gastonia, N. C., President-Elect.

E. D. Burchard, Asheville, N. C., Retiring President.

Volatile matter (d.b.) digested sludge....	33	"	"
pH of digested sludge.....	6.7	"	"

Operating costs reported by Mr. Lybrook between June, 1931, and June, 1935, vary between $12.22 (1933) and $9.08 (1935)—the average being $11.00 for the 4 year period. Some of the costs per m.g. follow:

Item	Max. Year	Min. Year
Salaries and Wages.....	$6.54	$4.82
Power and Lights..... (pumping included)	3.99	3.03
Supplies	0.394	0.062
Maintenance:		
Equipment	0.578	0.281
Cars and Trucks	0.379	0.216
Buildings and Grounds.....	0.249	0.061
Other Expenses	0.345	0.121

From these figures it was clear that the reduction in cost of treatment from $12.22 in 1933 to $9.08 in 1934 was effected through salary and wage reduction, primarily, and the cutting down on the item of "supplies." As to the reduction in power costs Mr. Lybrook explained that this had been effected by making a change from automatic variable speed pump operation to fixed speed, with automatic start-stop operation, which allowed the pumps to operate at greater efficiency and with a 25 per cent reduction in power consumption.

"North Carolina Laws Relating to Municipal Water Works and Sewerage Systems"—by T. S. JOHNSON, Professor of Civil Engineering, N. C. State College, Raleigh, N. C.

Mr. Johnson analyzed the three recent laws put on the statute books of North Carolina that related to municipal water works and sewerage systems. For these, he said, W. M. Piatt had been largely responsible as Chairman of Legislative Committee of the two associations. (1) It was now legal for cities to operate sewerage systems as public utilities and charge a specific sewer rent, adequate to maintain the sewerage system on a self supporting basis. (2) Another law allowed for a consolidation of the water works and sewerage systems and the adjustment of water rates, to make both self supporting. It was not required that the service charge for sewerage be carried as a separate item in billing, but it was not legal in N. C. to hold water or sewerage bills as liens against the property and therefore must be collected as any other utility charge was. (3) Bonds to finance sewers and sewage treatment plants could now be issued as utility bonds and not charged against the cities debt limitations.

Mr. Johnson said that under these new laws the city would, in reality, be charging for the *use* of the water and also for the cost of re-cleansing it. To take care of the industrial sewage situation, the law provides a method whereby the municipality can assess special charges against the manufacturer for handling his wastes. He regretted that a fourth law, aimed at protecting the Water Department reserve or surplus income against bleeding for transfer to the general tax fund, had failed to pass.

M. W. Tatlock, Supt., Sewage Treatment Works, Dayton, Ohio

W. M. Piatt, Consulting Engr., Durham, N. C.

Capt. J. C. Michie, Supt., Water and Sewerage, Durham, N. C.; D. M. Williams, Asst., Water and Sewerage, Durham, N. C.; W. M. Franklin, Supt., Water and Sewage Treatment, Durham, N. C.

"Does Beautification of Sewage Treatment Works Pay?"—by M. W. TATLOCK, Supt. of Sewage Treatment Works, Dayton, Ohio.

Mr. Tatlock, in a most effective presentation supplemented with lantern slides, brought to the association Dayton's story of its effective plan of sewage works beautification and development of a park area and recreational grounds adjacent to the plant. Good-will and civic-pride had been the reward. The 18 hole golf course developed above the plant had been especially popular, two of the greens being within 1,000 feet of the plant. Tennis courts, a baseball field and picnic grounds were other developments. In the latter, 9 fish and lily ponds in series had been created for their added beauty. On the other side of the plant was the 160 acre farm operated by the sewerage utility at a profit. The plant proper had been attractively designed, employing tile roofed Spanish architecture which was now partially vine covered and surrounded by graceful Lombardy poplars and elms. From the offices, across the patio of the administration building with its central fountain, could be frequently seen a pastoral scene consisting of the farm's flock of sheep grazing the lawn to make a profit in wool and lambs and less labor and wear and tear on the motorized lawn mowers. On the plant grounds effective plantings of flowering bulbs and evergreens added attraction.

Mr. Tatlock stressed the well supported fact that it took a lot of odor to brand a beautified sewage plant as a "stench factory"; and, in general, plants smelled about as bad as they looked to the lay visitor and neighbors. Further, he had found that the stigma of being a "sewer plant operator" was removed when a plant was appealing to the eye and was maintained in keeping with its surroundings. They, in Dayton, could say that beautification paid!

M. F. TRICE, after complimenting Mr. Tatlock, commented that not only had North Carolina municipalities been sued before providing sewage treatment but also afterward. He suggested that there might be something to say for sewage works beautification as an influence on juries, called upon to visit such plants, when deciding the extent to which the plaintiffs had or had not been damaged as the result of, or in spite of, the operation of the treatment works.

The Industrial Waste Problem at Durham

Prior to the visit to Durham's new Activated Sludge Plant, D. M. Williams, Assistant Supt. of Utilities at

R. T. Mills, Supt., Water Dept., Southern Pines, N. C.; R. O. True, Engr., Proximity Mfg. Co., Greensboro, N. C.; W. J. Parks, Supt., Water Dept., Asheville, N. C.

Durham, commented on the unique power generation situation wherein the sewage plant actually, at times, disposed of a surplus of power over the city owned power line. He also stressed the value of the practice, during the past summer, of shredding and dumping the wettest of the city's garbage into sewers for disposal, the procedure being in large part responsible for the development of the surplus power by the gas engines. He explained that it had been necessary to require the local textile mills, which had overloaded the plant, to provide a degree of preliminary treatment of their wastes before discharging to the municipal sewer. The extent of the industrial loading, without some preliminary treatment, could be appreciated when it was realized that 35 per cent of the water supply went to 5 industrial plants. Partial treatment and regulated discharge to secure uniformity of quantity and quality of waste was going far to solve the problem.

"Activities and Plans of the N. C. Division of Water Resources" — THEODORE S. JOHNSON, Chief Engr., State Department of Conservation and Development, Raleigh, N. C.

Mr. Johnson briefly reviewed the work and services of his department which were of interest to water works and sewerage operators. Amongst these were the many hydrologic studies on N. C. streams in connection with future water supply or power developments. Published maps and stream flow statistics of value were available to show potential developments of N. C. water resources and more were planned or under way. Stream gaging, evaporation and ground-water studies were the most important in the water supply field—90 gaging stations now being maintained. Another phase of the work, now receiving more attention, was the study of pollution of N. C. streams, the need for sewage or industrial waste treatment at certain points, and to what degree. Mr. Johnson invited the cooperation of engineers and operators and offered as much.

Electrical Grounding and Water Pipes

A considerable period was devoted to the question of the ill effects to pipes, meters or mains and hazards created by grounding the neutral electric wires to household water piping. Secretary M. F. Trice opened the subject by reviewing history, wherein grounding on water piping had at one time been sanctioned by A.W.W.A. provided an insulating joint be installed in the service line. Since present day and proposed future methods of grounding to water pipes had been recently thought to be injurious, destructive or dangerous, A.W.W.A. had recently gone on record as objecting to *any* form of grounding to water pipes.

DEWEY W. JOHNSON, Asst. Engr., Cast Iron Pipe Research Assn., Chicago, Ill., presented a carefully prepared and well grounded discussion of the question of grounding. In his investigations no serious hazards to water utility employees had been uncovered. He said that grounding D.C. current to water pipes would be destructive but not so in the case of A.C. systems: For example, the ground from a radio set (pulling about 75 watts) would leak only 1 to 2 milli-amperes, unless very near the broadcasting station, and telephone circuits were even less important. Mr. Johnson closed by saying that the survey made by him had given no justification for the alarm sounded against the official electrical code practice of grounding household appliances and the neutral wire to household plumbing. It was his opinion that present knowledge was not sufficient to require that such grounding as now practiced and specified in paragraph 909-F of the National Electric Code should be prohibited henceforth.

C. E. RHYNE, Supt., Water and Light, Gastonia, N. C., gave a practical illustration to show that a substitute ground through metallic rods or buried plates had not proved nearly as effective and, therefore, far less safe than the water pipe ground which he eventually had to go to in order to effectively ground a pumping station.

A representative of a North Carolina electric utility said that no substitute for water pipe grounding had been as satisfactory and that a normal system would show no current flowing through the grounded neutral (3rd) wire of modern wiring unless something went wrong. Even though plates or rod ground be employed, leaking current would thereafter find its way to the nearest water pipe or main.

R. V. FORD, Ford Meter Box Company, said that a recent questionnaire had revealed several shock cases and one death amongst water works employees changing meters or making repairs to service lines.

D. M. WILLIAMS, Durham, said that he considered grounding of household appliances to water pipes to be O.K. but warned that transformer and lightning arresters should be carefully controlled and watched.

"Experiences in Water Purification at Durham"—by WM. M. FRANKLIN, Sanitary Engineer, Water Works and Sewerage Department, Durham, N. C.

Mr. Franklin in describing the two Durham filtration plants directed attention to the special design of filter bottoms and rate controllers. The false bottoms, designed by W. M. Piatt, involved the use of concrete slabs containing many small glass tubes set therein to serve as non-corrodable orifices. Taste and odor problems had been more marked as result of a 40 m.g. raw water storage reservoir, requiring 3 or 4 applications of copper-sulphate each season—0.25 p.p.m. being the effective dosage. Activated carbon, prechlorination, and, at times, permanganate had been used to aid in removal of manganese when in excess of 0.15 p.p.m. in the raw water.

In coagulation, sludge return to the raw water was practiced during low turbidities by making use of a low head slow speed centrifugal. The practice of returning to the raw water 6 to 10 per cent of the coagulated had

M. Swartz, Supt., Water Comm., Greeneville, N. C.; W. H. Hall, Duke Univ., Durham, N. C.; D. W. Johnson, Cast Iron Pipe Research Assn., Chicago, Ill.

W. H. Booker, Chief Engr., Dept. Health, Raleigh, N. C.; D. S. Abell, Asst. Engr., Dept. Health, Raleigh, N. C.; P. W. Frisk, American Enka Corp., Asheville, N. C.

reduced the alum consumed by 10 per cent. What the benefits would be with high turbidities had not been determined but the scheme had more than paid for itself so far. To further assist coagulation and secure sludge stabilization between 1. and 1.5 p.p.m. of powdered carbon was being added to the raw water continuously at the point of prechlorination. To the finished water chlorine and ammonia (ratio 4 to 1) had been effective in eliminating complaints from red water and black water due to putrefaction in dead ends. To cleanse filter sand caustic soda treatment (1 lb. per square foot of filter area) had been effective. Manganese on the gravel had been removed with oxalic acid.

In reply to a question, Mr. Franklin explained that the coagulating scheme involved recirculation of 6 to 10 per cent of the coagulated water through the mixing chamber, the pump taking from the mixing chamber outlet. There was no return of the sludge from the coagulation basin.

"Experiences with Sport-forming Bacteria and High Concentration of Organic Matter"—by P. W. Frisk, Chemical Engr., American Enka Corp., Enka, N. C.

Mr. Frisk referred to the need of refined water treatment at Rayon production plants. To avoid raising the hardness, caustic soda had been substituted for lime in coagulation and pH adjustments. In addition to prechlorination, permanganate treatment (0.6 to 0.7 p.p.m.) was frequently required to insure a low organic and a manganese free water. To control algae, ammonia and chlorine (ratio 1 to 3) was added at a narrow point in the raw-water reservoir and residual chlorine had thereby been maintained over the reservoir area extending ¾ mile above the filter intake.

Mr. Frisk told of experiences during the past summer with a foamy like gelatinous substance in the basins and filters which cut 40 to 60 hour filter runs to 8 hours. Examination proved the trouble to be due to spore-forming organisms identified as cellus substle. To clean filter sand, coated with organic matter and manganese, they had employed a 5 per cent caustic solution drawn down into the sand bed and allowed to stand 24 hours. Less than that strength had been too slow acting. The soak was followed by 3 hard washings. To sterilize filter beds a hypochlorite solution (30 p.p.m. chlorine) was run into the drained bed, allowed to stand 12 hrs. and removed by washing.

"Experiments on Depth of Filter Bed and Effective Size of Sand"—by Dr. Meredith Thompson, Asst. Engr., State Dept. of Health, Raleigh, N. C.

Dr. Thompson reported on the results of studies involving experimental filters (2 inch glass tubes) with eight filter sands, varying from 0.17 to 1.3 mm. effective size and in depths varying from 18 to 48 inches. The findings from 36 runs had been correlated with practical operating results secured in the plant filters handling the same water.

Average length of filter runs, based on reaching 8 ft. head loss, or the passage of 0.5 p.p.m. turbidity by coarser sands, had been the following—(0.17 E.S. = 6 hrs.) (0.35 E.S. = 28 hrs.) (0.55 E.S. = 48 hrs.) (0.73 E.S. = 90 hrs.). With properly prepared water an 18 inch deep bed of 0.73 E.S. sand had produced entirely satisfactory results and the bed penetration by flock had been only 8 inches. Results from this coarse shallow filter had equalled those from the 30 inch beds of 0.35 m.m. sand and had washed more freely and given runs almost four times as long. In studying washing rates, a bed expansion of 40 per cent had been overall the most effective rate. Dr. Thompson said that taking all results into consideration coarser sands (up to 0.73 E.S.) were indicated as preferable to the generally accepted finer grades; depth of beds greater than 18 inches was apparently a non-essential in properly designed and operated plants.

Open Forum

(Chairman Elect, C. E. Rhyne—Presiding)

The "Open Forum" session involving a dialogue type of discussion of operating and maintenance topics was opened with:

"The Use of Inhibitors in Acid Solutions for Cleaning Corroded and Choked Pipes"—by A. R. Hollette, City Engr., Chapel Hill, N. C.

Mr. Hollette presented a review of published experiences with the use of acids of cleaning rust-choked piping, with the aid of organic inhibitors added to the acid to preclude destructive action by the acid on the clean metal of the pipe while doing its work of loosening and removing the rust or dissolving encrustations. Several instances had been reported wherein costly replacement of piping in large buildings had been avoided by acid cleansing involving the use of commercial inhibitors. F. N. Speller and associates had recorded (Proc. Am. Inst. Chem. Engrs. for 1927; p. 165) the cleaning of piping in a 35 story office building by filling a section of piping with inhibited hot muriatic acid, draining and flushing after a 5 hr. contact period. The work was done gradually by systematic planning and operations during week ends. More recently, Abrams and Wagner had reported (Water Works and Sewerage, May 1935; p. 192) successful application of 14 per cent muriatic acid to which 3 per cent, by volume, of a commercial colloidal inhibitor had been added. The solution was pumped to the upper stories and sections of the piping were filled, allowed to stand eight hours, emptied and flushed. Attempts to use a scheme of recirculation of the solution by pumping had failed because of serious clogging at restricted points by the quickly loosened scale and rust.

A. R. Hollette, City Engr., Chapel Hill, N. C.

J. C. Martin, Supt., Water and Sewerage, Tarboro, N. C.

The cost of cleaning 2,800 ft. of piping (½ to 4 inch) had been $20.00 for acid and inhibitor and $870 for labor, etc., compared with the estimated cost of $8,500 for renewing the pipe system.

Forum Topics

(M. F. Trice, Leader)

Prechlorination Effects—

Asked to discuss the action of prechlorination on filter beds, L. L. Hedgepeth stated that the reduction in mudballs, and the generally cleaner sand resulting, was without much question the result of destruction of living filamentous growths which acted as a floc and mud binder to agglomerate the fine sand, creating bed shrinkage and ineffective washing.

L. H. Enslow, said that he concurred in Hedgepeth's explanation, likening the chlorination effect to that of the blow-torch used by painters to granulate adhesive paint films for easy removal with a wire brush or putty-knife. In addition, the stopping of multiplication of bacteria in the filter beds was an important factor.

Manganese Removal from Sand—

There seemed to be a difference of opinion concerning the most effective method of cleaning filter sand coated with manganese bearing depositions. In some instances caustic soda had been found effective and acid or heavy chlorination in others. In the discussion it came out that deposits from manganese bearing ground waters, low in organic matter, were largely mineral and therefore more readily removed by acid or strong solutions of chlorine. Where the manganese was deposited along with considerable organic matter (surface supplies principally) caustic soda had proved effective.

Manganese Interference—

To overcome errors in the residual chlorine test, created by the presence of manganese, the most dependable procedure seemed to be that of removing the manganese from the sample, prior to testing, by precipitation according to the method of Scott (Water Works and Sewerage, March 1935, p. 58). An approximate indication of the extent of the manganese error could be had after dissipating the chlorine and chloramine by boiling the sample 5 minutes and cooling before making the chlorine test.

Main Flushing Practices—

In this discussion, flushing every 30 days seemed sufficient. As reported by M. Schwartz of Greenville, N. C., a more frequent flushing was necessary whenever the water temperature reached 85 deg. F. On dead ends 15 minute flushing was required for the hydrant discharge to clear up.

Treating the water to reduce corrosion and bacterial multiplication in dead ends seemed to be the best solution for most dead end troubles and eliminated the need for frequent flushings during warm weather.

Sewer Flushing Practice—

The opinion seemed to be that automatic flush tanks on sewers were obsolete, wasteful and non-dependable appurtenances. A. O. True (Greensboro) said that a survey had disclosed that most of them were not functioning, were out of order or leaking badly. H. E. Beckwith (Pitometer Co.) reported findings during Pitometer water-waste surveys which had resulted in the discontinuance of these notorious water wastes, in favor of the more certain and economical routine hose flushing program. C. E. Rhyne (Gastonia) reported that his experience checked with those reported and in consequence 17 flush tanks had been shut off.

Hawley Biological Film a Hi-Light

The remarkable film, picturing the habits of microscopic aquatic animals and plants, made by Major John B. Hawley, Cons. Eng., Fort Worth, Tex., which created so much interest when shown by the Major before the Convention of A.W.W.A. at Cincinnati, was loaned the N. C. Section for showing at the meeting. (Any water works or sewerage association, or Section of A.W.W.A. which has not availed itself of this outstanding film for its meetings will find its showing a high-light on any program.—Ed.)

The movie made by the Chicago Health Department, to picture hazards created by cross-connections between water piping systems and plumbing fixtures or sewer lines in buildings, was shown by D. S. Abell, Assistant Engineer, N. C. Department of Health, who explained the cause of the dysentery outbreak in Chicago and corrective measures being applied as a result.

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Jesse W. Roberts Dies

We have just learned of the sudden death of Jesse W. Roberts, President, Roberts Filter Manufacturing Company, Darby, Pa., who died after a brief illness, on November 7th.

Mr. Roberts grew up with the company which was organized by his father, Charles V. Roberts, as a company manufacturing household faucet filters. From this beginning the business was expanded to the production of pressure and gravity type filters for industrial and municipal use. Today Roberts' filters and filter plant equipment are known the world over. It is believed to be the oldest American filter manufacturing firm in business today.

We regret that more of Mr. Roberts' achievements and his life history cannot be gotten into this issue now ready for press. He was about 50 years old, and leaves a widow and three sons.

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Association Meetings Scheduled:

Dec. 19—**New England Water Works Association.** (Monthly Meeting.) Hotel Statler, Boston, Mass. Secy., Frank J. Gifford, Statler Bldg., Boston, Mass.

Dec. 27—**New York Section, A. W. W. A.** (Mid-Winter Meeting.) Hotel New Yorker, New York City. Secy., R. K. Blanchard, Neptune Meter Company, 50 West 50th St., New York City.

Jan. 15, 1936—**New York State Sewage Works Association.** (8th Annual Meeting.) Hotel Astor, New York City. Secy., A. S. Bedell, State Department of Health, Albany, N. Y.

March 23-25, 1936—**Kentucky-Tennessee Section.** Lexington, Ky. Secy., F. C. Dugan, State Board of Health, 532 W. Main Street, Louisville, Ky.

April 1-3—**Canadian Section, A. W. W. A.** (Annual Convention.) Royal Connaught Hotel, Hamilton, Ont. Secy.-Treas., A. E. Berry, Department of Health, Parliament Buildings, Toronto, Ont.

Aprl 7-9—**Indiana Section, A. W. W. A.** Purdue University, Lafayette, Ind. Secy.-Treas., John A. Bruhn, Indianapolis Water Co., Monument Circle, Indianapolis, Ind.

June 8-12—**American Water Works Association.** (Annual Convention.) Biltmore Hotel, Los Angeles, California. Secy., B. C. Little, 29 West 39th St., New York City.

EDITORIAL

Operator Licensing

IN the November issue of WATER WORKS AND SEWERAGE, as in previous issues, there have appeared discussions on this page dealing with the security of operators of municipal utility systems and the betterment of their social and economic status. One avenue of approach to the attainment of enhanced security of position and commensurate compensation appeared to us to be through an operator licensing system, in some form, which would automatically distinguish the officially certified operator from the job-holding appointee. Another way of expressing this point of view is to say, that management of municipal utilities would be maintained on a business like efficient basis should the elected municipal official come into office to find that the operating heads and their principal subordinates were "certified" employes; and, not subject to replacement by other than equally qualified men who enjoy the stamp of certification, viz., the requisite qualifications which the award of the official operator's license denotes.

There seem to be two major objections to the licensing system: The engineer or chemist who feels himself in a professional status does not like the idea that he is to become a licensed operator and particularly does he object to the thought of being subjected to a regulation involving the necessity of a periodic renewal of his license. Still other operators fear the possibility of having difficulty in passing the examination and other requirements imposed by the certifying authority. They fear the stigma of possible failure and likelihood of loss of job as the result. Still others are so lacking in ambition, or just so plain lazy, that they wish to avoid the preparation and efforts entailed in connection with preparation for the examination. To avoid whatever may be the undesirable features of a system of enforced licensing, voluntary operator licensing systems have been introduced in a few states. notably Texas and Georgia, in conjunction with operator short schools, while other states are proposing to follow the same scheme.

In this issue we present an article by Edward S. Hopkins, dealing with the subject of "Short Schools and Licensing," in which he, as an operator, sees much of value in short-schools for operators, but argues vigorously against the system of operator licensing for municipal as well as privately owned utility employes. His argument is that the professional status of the trained operator is lowered when he is required to operate under a license. He believes that licensing regulations cannot be drawn so as to be uniformly and equitably applied and, therefore, licensing of a legal nature cannot be made practicable. Instead of mandatory licensing by state authorities or licensing boards he recommends that an attempt be made to educate local municipal appointing authorities "to a realization of the fundamental sciences involved, with the resultant appreciation of adequately trained professional personnel."

This program Mr. Hopkins considers to be "a task for sanitary engineering bureaus of state health departments, technical societies and associations." At another point Mr. Hopkins states that, based on evidence at hand, he is forced to conclude that "the necessity for licensing of operators has not been proven." Further, that the argument that licensing of operators is primarily aimed at the protection of the public health is a weak one, because state health authorities have, or could have, power to control plant personnel by preferring charges against incompetent and inefficient operators and, with due proof, demand of local authorities their replacement with approved operators.

We agree that Mr. Hopkins' suggestion that, in the long run, the most desirable means of raising the status of municipal utility managers and operators, and insuring their security against political interference, is through the method of education. But, we believe this method to be far too idealistic and impractical as a corrective of early or universal benefit. To anyone who has been connected with sanitary engineering work of state health departments, it does not have to be said that educational efforts in "City Hall" is at best a tedious process; and, by the time the course has been completed a new crop of "freshmen" have come into office. Particularly is this true of the small towns, where the task of selling the authority on the need of employing trained operators, at adequate compensation, is especially difficult. To the run and file of elected municipal officials, frequently too busy with other duties to be reached through educational procedure, notification from the certifying or enforcement authority, to the following effect is stated in easily understood language—with, or without, educational effort.

"Mr. Smith, who has been recently replaced by a new appointee as your superintendent of water, is a legally licensed operator. Inasmuch as the new appointee has not qualified for the position as required by law, it will be necessary to reinstate Mr. Smith promptly. If his employment is to be terminated he must be reinstated at least until a qualified (certified) operator can be secured to replace him. On this point the Operator Licensing Act of this state is clear and we have no other recourse than to enforce it for the protection of the public health and, incidentally, for the protection of the public health and incidentally for the protection of the interest and properties of municipalities and their citizens."

Some of our most valued citizens were, as boys, forced to "take an education" and it is with the same idea that education of municipal authorities may best and most promptly be secured through operator licensing acts. What education alone might do for the sons and grandsons of tomorrow, licensing acts can accomplish for the fathers of today.

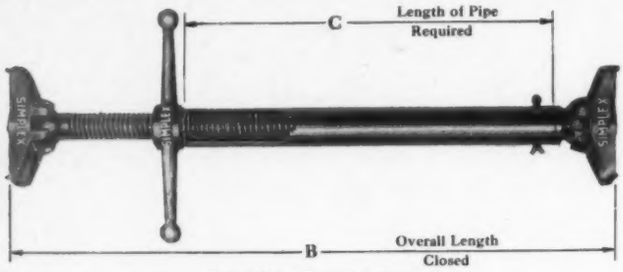
A genuine growth of interest in the possibilities of operator licensing has been shown as evidenced by the growing interest in the voluntary licensing system. As a starting procedure, voluntary licensing will disclose the most satisfactory elements, to be retained, and the undesirable features to be corrected. This seems to be a practical and sound method of testing and perfecting a system that will prove most satisfactory in meeting sectional requirements and avoid possible conflicts with existing laws. Once the ice is broken, operators find the benefits, lose their fears and realize that licensing, registration, certification, mean one and the same thing in the final analysis, the evolution of licensing acts will be quickened. We lean a bit toward the term "Certified Operator" or "Registered Operator," but, after all, the protection against political interference is the important element of the licensing act regardless of terminology and titles of those certified.

He who has attempted to educate a corn-eating mule to like oats, or break a dog from sucking eggs, will appreciate the formidableness of the "task" that Mr. Hopkins would assign state sanitary engineers and association officials as a means of protecting operators against the political spoils system through education and health department actions. We still believe in the value of some legislated form of protection of operating heads and principal assistants of water works and sewerage systems which, in turn, protects the interests of the public at large.

NEW EQUIPMENT AND LITERATURE

Simplex Trench Braces

The improved "Simplex" Trench and Sewer Braces announced by Templeton, Kenly & Co. of Chicago (jack and brace manufacturers since 1899), are now constructed throughout of steel drop forgings to insure practical and economical bracing with a high safety factor. Ball and socket joints at each end (see cut) make for quick easy adjustment and tight grip at all angles. This improved "Simplex" brace becomes an all use brace merely by substituting one length of the indestructible steel pipe for another. The new brace is being offered by the manufacturer at prices no higher than those of the old type malleable iron grace. For descriptive literature and prices, address Templeton, Kenly Co. (W. W. S. Dept.), 1020 S. Central Ave., Chicago, Ill.



Simplex Trench Brace

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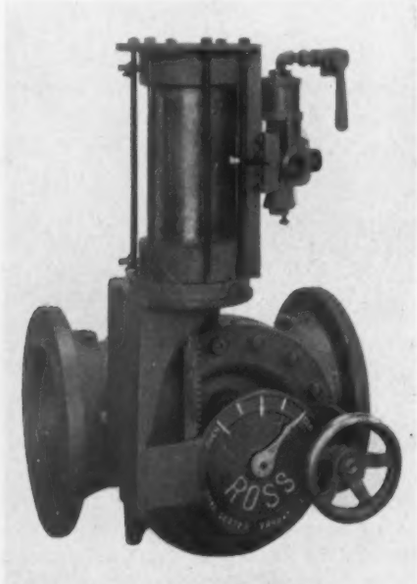
Improved Ross Plug Valve

Ross Valve Manufacturing Company of Troy, N. Y., well known specialty and automatic valve manufacturers since 1879, have recently announced the improved "Trojan" Dual Seated Throat Valve. As implied in the name it is a throat valve having two seats, either of which may be used for the closure, with or against the direction of water flow. The new valve may be assembled as a Venturi type or with standard size case to take a plug-rotar with openings the full diameter of the main. It comes equipped with a hand wheel (see cut) for manual operation and a piston for hydraulic operation (with pilot for automatic control); or it may be electrically operated by motor. Timing of opening and closing is simply adjustable and all controls may be tested, adjusted or dismantled without interruption of flow. These valves come with C. I. body, with seats and moving parts of bronze or other corrosion proof materials.

These improved free-flow plug type double seated valves were designed to serve as minimum head loss valves for conduits or free discharge lines, or as an automatic valve to serve as check valves or altitude valves.

For illustrated descriptive catalog ask for Bul. No. 35-A. Address Ross Valve Manufacturing Co., Troy, N. Y.



Ross Valve

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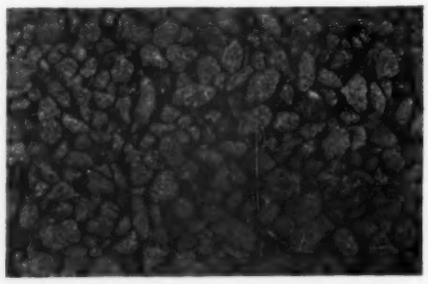
"Birm," an Iron Removing Mineral by Burgess

C. F. Burgess Laboratories, Inc. (Engineers) of Madison, Wis., have perfected a novel material which removes iron from waters passing through a bed of the mineral. The name "BIRM" is coined from the first letters of the full name, Burgess Iron Removing Mineral.



"Birm"

Distinguished by its catalytic surfaces BIRM is in appearance like coarse filter sand, but weighs only 60 lbs. to the cubic foot. It functions to convert soluble iron into deposited ferric hydrate through surface contact. The product is adaptable to use in closed pressure type filter units or open gravity units at rate of 3 to 5 g.p.m./sq. ft. and is backwashed at rates of 12 to 15 gal. sq. ft. min. One of the principal claims of the manufacturers is "automatic and complete iron removal without addition of chemicals," backed by demonstrated performance.

For additional information on "BIRM" address Burgess Laboratories, Inc. (Water Treatment Div.), Madison, Wis.

▼

Crane Appoints Simmons Advertising Manager

Crane Company, Chicago, announces the appointment of H. H. Simmons as Advertising Manager.

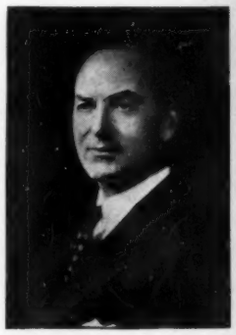
Mr. Simmons for the past nine years has been associated with Russell T. Gray, Inc., Chicago advertising agency, of which he has been vice president and account executive. To his new position he takes a broad training in advertising, particularly in the industrial and trade paper fields.

H. H. Simmons

▼

Henry W. Foulds Made Vice-President in Charge of Permutit Company Sales

Mr. Henry W. Foulds has recently been elected vice-president of The Permutit Company. He will correlate and direct all sales, sales - promotion and advertising of the company in the expansion under way.



Henry W. Foulds

Mr. Foulds, a graduate chemical engineer, with twenty years' experience in selling, was formerly vice-president in charge of distribution of a well-known line of refrigerators and was also vice-president of a pump manufacturing company.

Assisting Mr. Foulds will be L. S. Ferguson, manager of industrial sales; O. P. Harris, manager of domestic sales, H. H. Wilkinson, advertising manager.

This announcement comes from the office of W. Spenser Robertson, president of Permutit Co.

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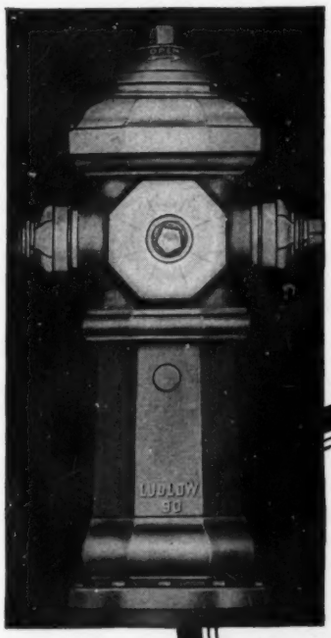

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• Breaks *above* ground in case of accident. • Can be replaced without digging. • Beautiful outside symmetry.

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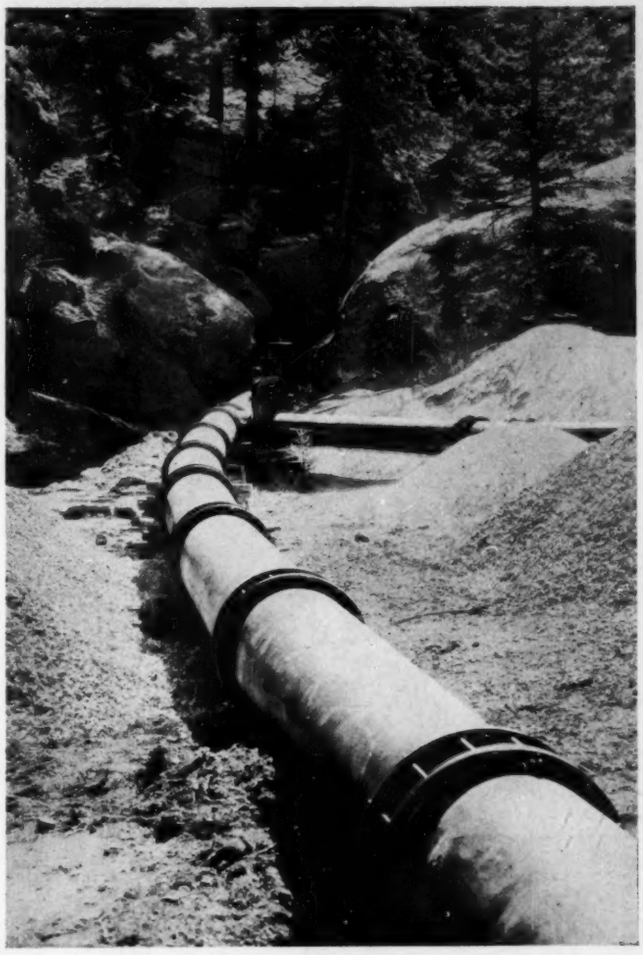

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The above curve is made with straight sections of plain-end pipe and standard Dresser Couplings, and illustrates an important advantage of the Dresser joint—its *flexibility*. • Each pipe section entering a Dresser joint can be deflected laterally or vertically for curves, grades, trench irregularities, etc., without injury to the coupling or without affecting its permanent tightness in any way. • This feature of flexibility is but one of *five* major advantages offered by Dresser Couplings. Use this modern method of connecting pipe on your next job. It has the approval of three generations of pipe-line builders.

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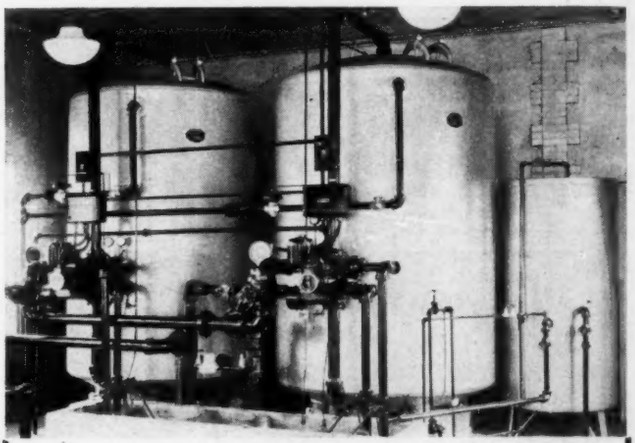

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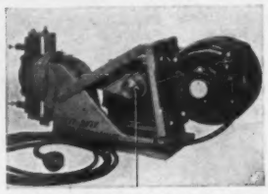

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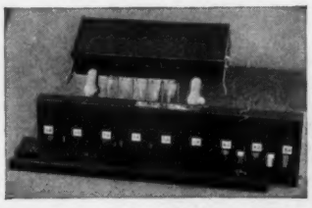

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A

Alvord, Burdick & Howson 48
American Brass Co., The 13
American Gas Products Corp. 6
Anaconda Copper & Brass 13
Arrowhead Iron Works 50
Atlas Mineral Products Co. of Pa., The 51

B

Bellevue Stratford Hotel 49
Black and Veatch 48
Builders Iron Foundry 10
Burns & McDonnell Engr. Co. 48

C

Carborundum Company, The ..... Third Cover
Cast Iron Pipe Research Asso., The 14
Chester Engrs., The J. N. 48
Chicago Testing Laboratory, Inc. 48
Columbian Steel Tank Co. 51
Crane Company 11

D

Dresser Manufacturing Co., S. R. 47

E

Edson Corporation, The 50
Everson Filter Co. 50

F

Filclor Company, The 50
Ford Meter Box Co. 51
Fuller & McClintock 48

G

Great Western Electro-Chemical Co. 8

H

Hellige, Inc. 51
Hill, Jr., Nicholas S. 48
Hudson Coal Co., The 8
Hydraulic Development Corporation 8

I

Industrial Chemical Sales Co., Inc. 5
International Filter Co. 47

K

Knowles, Inc., Morris 48

L

LaMotte Chemical Products Co. 50
Link-Belt Company 9
Lock Joint Pipe Co. 51
Ludlow Valve Mfg. Co., The 47
Lynchburg Foundry Company 10

M

Mathieson Alkali Works, Inc., The 12
Metcalf & Eddy 48
Morse Boulger Destructor Co. 51

N

National Water Main Cleaning Co. 50

O

Oliver United Filters, Inc. 4

P

Pacific Flush Tank Company 51
Pennsylvania Salt Mfg. Co. 7
Permutit Company, The 49
Pirnie, Malcolm 48
Potter, Alexander 48
Powell, Shepard T. 48
Proportioneers, Inc. 50

R

Roberts Filter Mfg. Co. 50
Royer Foundry & Machine Co. 6

S

Sika, Inc. 49
Simplex Valve & Meter Co. 49
South Bend Foundry Co. 52

T

Taylor & Co., Inc., W. A. 51

U

United States Pipe & Foundry Co. ..... Second Cover

W

Wallace & Tiernan Co. ..... Back Cover
Warren-Knight Co. 52
Wentworth Hotel 50
Whitman & Howard 48
Wilson, P. S. 48

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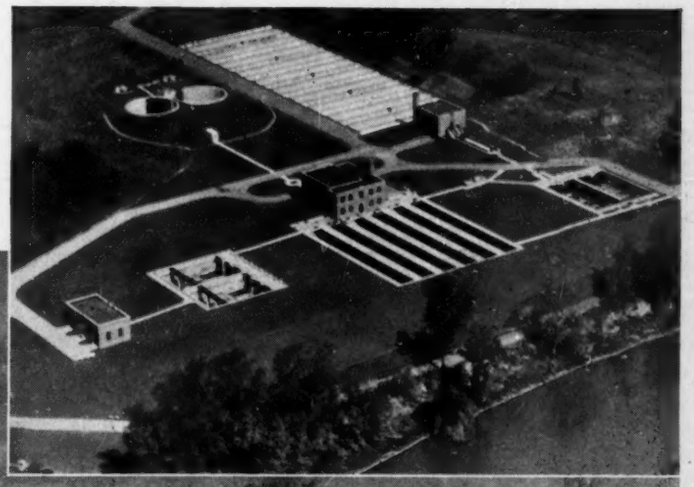

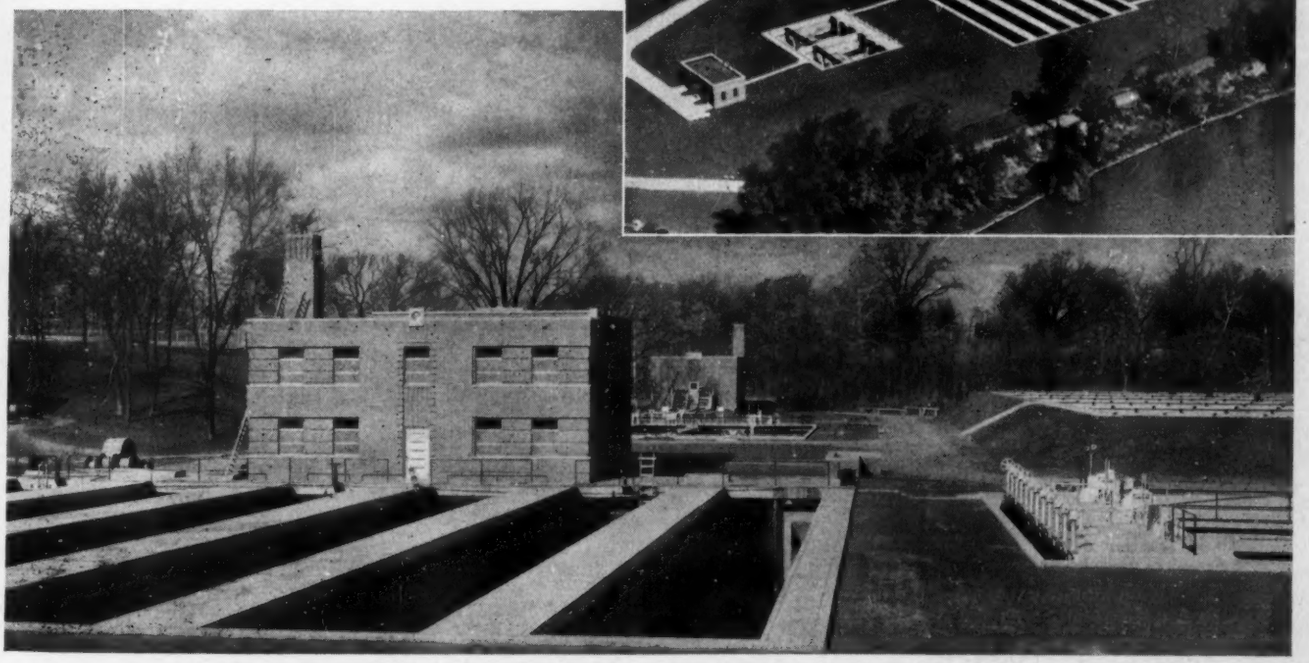

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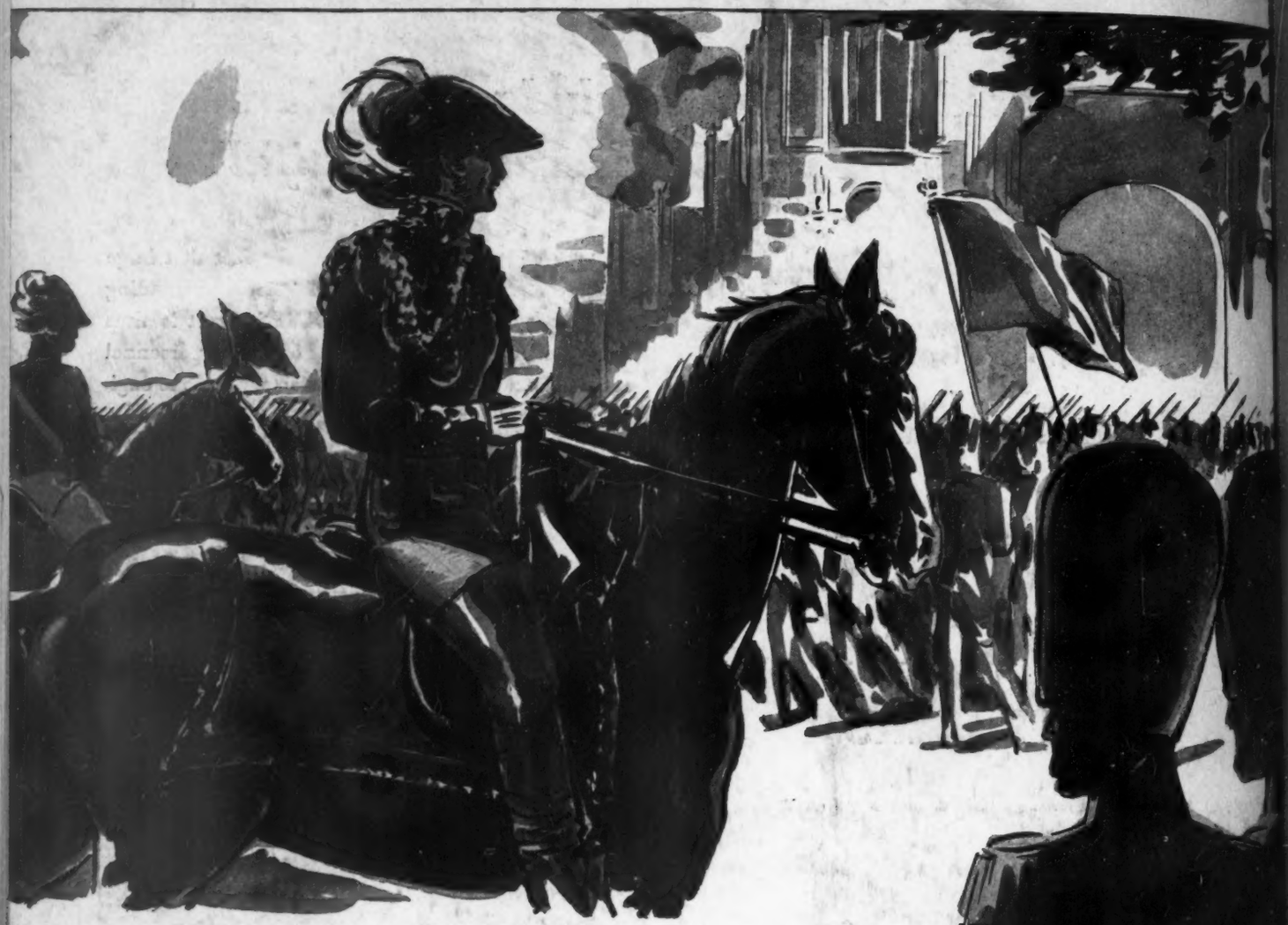

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